

HORTICULTURAL ABSTRACTS.

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No. 1

Initialled abstracts in the present number are by Mrs. R. M. Ingham of the Imperial Bureau of Plant Breeding and Genetics, Cambridge, and by W. S. Rogers and H. Wormald of the East Malling Research Station.

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[illegible]

Horticultural Abstracts

Vol. XI

March, 1941

No. 1

MISCELLANEOUS.

*Growth substances.**

1. GRACE, N. H. 577.15.04
Effects of dusts containing indolylbutyric acid and oestrone on the rooting of dormant *Lonicera tartarica* cuttings.
Canad. J. Res., 1940, 18, Sec. C, pp. 283-8, bibl. 3.

Indolylbutyric acid and oestrone, separately and in combination in a series of talc dusts, were applied to dormant cuttings of *Lonicera tartarica*. The acid stimulated the rooting number and length of roots per cutting, mean root length and green weight of leaf produced. Oestrone was depressing in its effects throughout, tending to offset the beneficial results of the acid except in one case where the combination of both chemicals at 100 p.p.m. each proved beneficial to root length per rooted cutting. It is suggested that further experiments should deal with oestrone concentrations below 100 p.p.m.

2. GRACE, N. H., AND FARRAR, J. L. 577.15.04
Vegetative propagation of conifers† VI. Hormone solution and dust treatments of spruce cuttings propagated in greenhouse and outside frames.
Canad. J. Res., 1940, 18, Sec. C, pp. 401-14, bibl. 13.

Indolylbutyric acid treatment had no beneficial effect on cuttings of Norway spruce taken monthly from January to April and propagated in sand in a greenhouse. Application at concentrations from 20 to 60 p.p.m. was followed by reduced rooting and increased mortality. The highest percentage of rooting averaged for all treatments occurred in February and April and short cuttings rooted very much better than long cuttings. Treatment with talc dusts containing indolylacetic acid, cane sugar and organic mercury, of Norway white and black spruce taken in late March had no beneficial effect, though injury from indolylacetic acid was somewhat reduced by its combination with organic mercury. Norway spruce rooted more readily than the other species. Cuttings made in May and June, some from new growth, showed little rooting. New growth cuttings gave more rooting when propagated in sand and watered with nutrient salts.

3. GRACE, N. H. 577.15.04
Responses of plant cuttings to treatment with naphthyl acids and their potassium salts in a talc carrier.
Canad. J. Res., 1940, 18, Sec. C, pp. 457-68, bibl. 16.

Cuttings of one herbaceous and of four dormant woody plants were treated with a series of talc dusts containing indolylacetic acid and the acids and potassium salts of several members of the naphthyl series of root growth stimulating chemicals. The higher members of the series compared favourably with naphthylacetic acid in respect to most of the responses considered, though there were indications that naphthylacetic acid or its salt had a greater effect on the number of roots per rooted cutting. Naphthylacetic and 1- γ -naphthylbutyric members of the series were equally effective as acids or salts; however, a mixture of the isomeric 1- and 2- γ -naphthylbutyric acids was more active than the corresponding mixture of salts. Conversely, potassium naphthylhexoate appeared to have greater activity than the acid. The results

* See also 186.

† Parts I, II, III, IV, V, *Ibidem* 17, Sec. C, pp. 178-80, 312-6, 376-9; *H.A.*, 10: 10, 11, 12 and *Ibidem* 18, Sec. C, pp. 13-7, 122-8; *H.A.*, 10: 802, 803.

suggest that pure naphthylbutyric acid, the isomeric mixture of acids, and potassium naphthylhexoate are virtually as effective as the recognized plant growth stimulating chemicals, indolyl- and naphthylacetic acids. A noteworthy feature of the results was the beneficial effect of treatment with talc alone. The promotion of new growth and rooting of dormant cuttings was of particular interest, though most of the other criteria studied also indicated beneficial responses. [Author's summary.]

4. COVAS, G. 577.15.04
 Aplicacion de las fitohormonas en la reproduccion vegetativa de las plantas. (**Growth substances and vegetative propagation.**)

Reprinted from *Ann. Inst. fitotec. Santa Catalina*, 1939, 1: 181-6, bibl. 4.

Hormona Roche 202, Hortomone A, Hormodin and indolylacetic acid were used successfully, especially the last, for increasing root proliferation in cuttings and branches of *Buxus sempervirens*, *Gardenia jasminoides*, *Pereskia saccharosa*, *Podocarpus Parlatoresi*, *Hydrangea opuloides*, *Medicago sativa*, *Fabiana imbricata*, *Dianthus* sp., *Thunbergia* sp. and *Coleus Blumei*. [Although this is said to be the first instance of successful vegetative propagation of *P. Parlatoresi* and *F. imbricata*, both species are commonly grown from cuttings in North America.]

5. MITCHELL, J. W., KRAUS, E. J., AND WHITEHEAD, M. R. 635.65 : 581.102 : 577.15.04
Starch hydrolysis in bean leaves following spraying with alpha naphthalene acetic acid emulsion.

Bot. Gaz., 1940, 102 : 97-104, bibl. 6.

A 1% naphthaleneacetic acid-lanolin and water emulsion was sprayed on the upper surfaces of attached bean leaves. The digestion of starch and accumulation of sugars, during a period of darkness or low light intensity, and the rate of accumulation of sugar and starch, during a period of illumination, were studied by means of quantitative chemical determinations made at intervals following treatment.

6. HAMNER, C. L. 577.15.04 : 577.16
Effects of vitamin B₁ upon the development of some flowering plants.

Bot. Gaz., 1940, 102 : 156-68, bibl. 3.

Vitamin B₁ added to a number of different plants grown in quartz sand supplied with nutrient solutions had no effect whatever in any direction. Such marked differences as occurred were traceable to the long or short photoperiods at which different batches were grown. The failure of vitamin B₁ in these experiments is contrary to results reported by a previous investigator.

General.

7. WADHAM, S. M. 63
British agriculture revisited.

J. Aust. Inst. agric. Sci., 1940, 6 : 67-78.

This is a very penetrating discussion on British agriculture and of the circumstances which have led up to and are likely to maintain it in its present uneasy condition. The value of the author's observations is enhanced by the fact that, while professionally concerned with agriculture from the practical and economic standpoints in Australia, he had not visited England since 1926 and so is presumably unaffected by any local or political bias and able to view the many thorny problems with impartiality. An account of the external changes in the appearance of the countryside and the innovations introduced in agriculture in Britain in the past 13 years is interesting.

8. CALLAGHAN, A. R. 63(072)
Linking research with extension.

J. Aust. Inst. agric. Sci., 1940, 6 : 61-7.

The present method or lack of method in passing on the results of scientific research to the farmer is criticized. Suggestions are made for the introduction of a more practical system.

9. ANON. 63 : 631.56
Recent research on Empire products.
Bull. imp. Inst., 1940, 38 : 325-33.

A record of recent work on agriculture and allied sciences conducted by government technical departments overseas.

10. HALL, D. 631.523
How the plant breeder goes to work.
J. roy. hort. Soc., 1940, 65 : 283-8, 327-33.

In this lecture, delivered at the International Congress of Genetics, Edinburgh, 1939, the substance of which is now reprinted, Sir Daniel Hall reviews the past work of the plant breeder, gives an outline of the scientific principles involved, discusses some of the notable results obtained and the methods by which they were achieved and indicates the direction in which investigation is proceeding.

11. CRANE, M. B. 635.1/7 : 631.531 : 631.55
Seed and food in war time.
 Reprinted* from *J. roy. Hort. Soc.*, 1940, 65 : 321-6.

An outline is given of the methods to be used in obtaining pure seeds from garden vegetables. The information concerns self- and cross-pollinated varieties, planting distances necessary to avoid cross-pollination and the difficulty caused by the giving of different names to similar varieties. The principles of inbreeding and outbreeding are touched upon. The paper concludes with a sketch of the work the author and others are doing at the John Innes Horticultural Institution, Merton, in the utilization of hybrid vigour in tomatoes. Already in some hybrid generations an appreciable increase in yield over the best yielding parent has been obtained combined with early maturity.

12. STOUGHTON, R. H. 663.61 : 581.084.1
Soilless cultivation of plants.
J. roy. hort. Soc., 1941, 66 : 17-24.

A practical account of the methods used in soilless cultivation of greenhouse crops. Formulae for the nutrient solutions used are given with directions for the maintenance of their equilibrium. The author prefers the sub-irrigation method by which the plants are grown in concrete tanks filled with gravel or cinders or coke and the nutrient solutions circulated at intervals by means of an automatic pump, the circulation also providing aeration.

13. KING, J. R. 581.162.3 : 631.523
Method for covering emasculated flowers in plant breeding.
Bot. Gaz., 1940, 102 : 217-20.

The method consists of spinning a rubber cement web over the flower parts by means of a special appliance which is illustrated and described.

14. SKINNER, A. F. 631.512
Contour furrowing.
Qd agric. J., 1940, 54 : 102-7.

A well-illustrated article on the subject of contour furrowing, i.e. ploughing the land along the contour with furrows at approximate intervals of 10 to 20 feet down the slope, but with a fixed vertical interval. Should the vertical interval on slight slopes lead to too wide a spacing of the furrows on the ground, intervening furrows can be inserted. Instructions and diagrams for making a wooden level to ascertain the correct contour lines to follow are given. The object of contour furrowing is to combat erosion. If obstacles such as stumps, etc., are encountered the furrow should break rather than go round. In fact an occasional break in the furrow with the furrow ends turned slightly uphill is useful in restricting the draining of water from the furrows in the event of a break or the existence of a low spot in the furrow line.

* In the Journal the photographs figs. 90 and 92 (not the legends) should be transposed. They are correct in the reprint.

15. DAVIDSON, J. B., AND VAN VLACK, C. H. 631.67 + 631.347

Ponds for farm water supply.

Bull. Iowa agric. Exp. Stat. Ext. Serv. Bull. P17, 1940, pp. 495-508.

The essentials of a successful farm pond are given as follows:—convenient location, adequate storage capacity, suitable and large enough drainage area, permanent dam and spillway, careful maintenance, fencing from stock, outlet to stock drinking tank. The influence of a pond on wells depends on relative positions, depth of well and character of subsoil. If the pond is to be used as a source of domestic water it must be protected from contamination and the drainage area should be woodland or preferably meadowland. The house and buildings should not be in the watershed. If the pond is to be used for irrigation, provision should be made for the extra capacity required. If deep enough, fish may be kept and wild fowl attracted. As regards cost, the largest item is that of building the dam.

16. GARNER, H. V. 631.8

Manures and manuring.

Bull. Minist. Agric. Lond. 36 [8th edit.], 1940, pp. 101, 2s.

Whoever wants to know what he should expect, what he should try to get and what he should avoid in buying organic or inorganic fertilizers will do well to consult this bulletin. The author deals in satisfactory detail with the following:—I. *Organic manures*, viz. farmyard manure, other straw manures, liquid manure, poultry manure, waste organic substances (dried blood, feathers, hair, greaves, hoof and horn, rabbit flick, slaughter-house refuse, fish waste, damaged feeding cake, shoddy refuse from tanneries, breweries and sugar works, town refuse, sewage sludge and seaweed), green manures. II. *Artificial manures*, supplying N, P, K or all together. III. The purchase and use of artificials on farm crops and the use of soil analysis. In an appendix he considers usefully the relevant sections of the Fertilizers and Feeding Stuffs Act 1926.

17. WEISS, F. E. 575.255

Graft hybrids and chimaeras.

J. roy. hort. Soc., 1940, 65 : 212-17, 237-43.

The nature of the chimaera in plants is described and well-known examples are discussed. It is shown that the true graft hybrid, i.e. the fusion of the vegetative cells of stock and scion, is still problematical, all the classic cases of so-called graft hybrids, e.g. *Laburnum Adami*, have been found on investigation to be sectorial or periclinal chimaeras. Examples of sectorial and periclinal chimaeras in pelargoniums, which arise naturally, are examined. It is shown that the potato, Golden Wonder, is a periclinal chimaera of Langworthy. By cutting out the normal eyes of tubers of Golden Wonder and growing them on with the adventitious buds, which arise from the internal tissues, Crane at the John Innes Horticultural Institution produced a crop of true Langworthy. Many of the varieties of potato grown in Russia have been proved to be of chimaerial origin.

18. WHITE, P. R. 578.082

Plant tissue cultures.

Biol. Rev., 1941, 16 : 34-48, bibl. 115.

A review of recent work (1936-40) on the cultivation of plant tissues *in vitro* with an outline of the probable future trends in this field.

19. JOHANSEN, D. A. 581.112

On the staining of plant tissues.

Chron. Bot., 1940, 6 : 30-1.

It is pointed out that in spite of the many dyes and staining methods now available, little attempt has been made to apply a modern, precise, polychromatic staining schedule to tissues merely to ascertain what the reactions reveal. The author mentions a number of interesting discoveries he has made as a result of correlating stain affinity with physico-chemical structure.

20. SHAPTER, R. E. 581.192 : 546.18

The estimation of phosphorus in plant material.

Reprinted from *J. Aust. chem. Inst.*, 1940, 7 : 155-63, bibl. 2.

The Lorenz gravimetric method of estimation of P_2O_5 , following oxidization by nitric perchloric acid as applied to the dry matter of plants, has been examined over a wide range of variation

in P_2O_5 content and under conditions similar to those encountered in the actual application of the method. Some variations in the amounts of P_2O_5 recovered were found; in general, if the ordinary Lorenz factor were used, results tended to be low, but in some cases they were high. The range of recovery was from a minimum of 97.9% to a maximum of 103.02% with quantities of P_2O_5 ranging from 21 mg. down to 0.4 mg. When less than these quantities were used (0.2 mg. down to 0.05 mg.) recoveries were from 97.9% to 126.3%, but, considering the errors involved, results were reasonably satisfactory. The method has given considerable satisfaction in practice on samples of plant material varying over a wide range of P_2O_5 content, results being always very concordant. [Author's summary.]

21. ALLARD, H. A., AND GARNER, W. W. 612.014.44
Further observations on the response of various species of plants to length of day.

Tech. Bull. U.S. Dep. Agric. 727, 1940, pp. 64, bibl. 2, 20 cents.

The authors have continued their studies on the effect of day length on plant growth previously reported in *J. agric. Res.*, 1920, 18: 553-606 and *Ibidem*, 1923, 23: 871-920. They tabulate and fully discuss their results in the present bulletin. They describe a long-day plant as one that ceases to flower or shows delayed or less profuse flowering when the length of day is sufficiently shortened, and a short-day plant as one that begins to flower or shows hastened or better flowering when the length of day is sufficiently shortened. There may be pronounced overlapping of the upper limits of flowering of the short-day plants with the lower limits of the long-day plants, but the fact remains that the decrease of daily light period ultimately causes the long-day plants to cease flowering or to flower less well. On the other hand when the daily light periods are shortened enough the short-day plants show the opposite tendency and their flowering is initiated, hastened or otherwise favoured. These behaviours appear to depend on physiological differences in the two groups. A few plants have been found which will flower only between certain limits of length of day, roughly between 12 and 16 hours of daylight. These can be termed intermediate-day plants. This different reaction to light period has already been shown to be of the utmost importance not only to the flower grower, but also to the market gardener in connexion with such crops as early strawberries, onion-growing in the tropics, lettuce, etc., and it is highly probable that in many cases of failure to crop under otherwise favourable conditions the reason lies in the length of daylight. Among the plants considered in detail here are the following:—*Chrysanthemums*; *Cosmos*, *Calendula*, *Tagetes*, *Zinnia*, etc.; various other *Compositae*, viz. golden rods, asters, *Helianthus*, *Rudbeckia* and *Echinacea*; grasses; various *Leguminosae* and *Labiatae*; *Sedum*; tobacco; annual flowering plants; various annual and woody plants; *Amaranthaceae*, *Asclepiadaceae*, *Caryophyllaceae*, *Cucurbitaceae*, *Lilaceae*, *Scrophulariaceae*.

22. MERKLE, F. G. 631.41 + 631.42
Soil testing. Operation, interpretation and application.

Bull. Pa agric. Exp. Stat. 398, 1940, pp. 34, bibl. 24.

Methods of determining the following are described:—calcium, magnesium, potassium, phosphate, aluminium, manganese, nitrate, pH value, replaceable hydrogen or lime requirement, organic matter. The interpretation of results and their accuracy and applicability are then discussed. Notes are given on how to judge and evaluate soils, diagnose the cause of trouble and decide what and how much fertilizer to use.

23. STEAD, H. A. J. 631.874
The decomposition of vegetable matter in the soil.

Citrus Gr., 1940, No. 79, p. 5.

An outline is given of the processes involved in the conversion of vegetable matter in the soil into humus. Plant material consists chiefly of (1) carbohydrates and lignin and (2) proteins. In (1) are the sugars, starches, cellulose and hardwood tissues, in (2) organic substances in which the presence of nitrogen is a characteristic. At the onset of the bacterial activity of decay the sugars and starches are first broken down into carbon dioxide and water and the proteins into amino acids. By these substances the soil microbes exist. Lignin and waxes, remaining practically undecomposed, unite with the protein complexes to form a large proportion of the soil humus. The amino acids are further broken up into carbon dioxide, ammonia and water.

The carbon dioxide escapes into the air or dissolves into the soil moisture, forming a weak acid which acts on the various plant foods held in the soil complex and makes them available to the crop. The ammonia forms ammonium salts which, converted by the nitrifying bacteria into nitrates, supply the nitrogen for plant assimilation. The ultimate products of decomposition consist of varying percentages of nitrogen, phosphorus, potassium, calcium and sulphur in forms available to plants, together with very finely divided portions of the original organic material incorporated into the soil and some complex secondary compounds formed during the process of decomposition. These organic substances and compounds are collectively known as humus.

24. HIBBERD, P. H. 631.416.8 : 546.47

Accumulation of zinc on soil under long-persistent vegetation.

Soil Sci., 1940, 50 : 53-5, bibl. 4.

Data are supplied to support the hypothesis that long-continued decay and accumulation of vegetable matter under trees causes accumulations of considerable amounts of zinc and other mineral matter in the top soil.

25. WOLF, B. 631.416.8 : 546.27

Factors influencing availability of boron in soil and its distribution in plants.

Soil Sci., 1940, 50 : 209-16, bibl. 3.

In a study of the effects of lime and fertilizers on the adequacy of the supply of boron in Sassafras sandy loam, it was found that, for radishes and cauliflower:—Boron deficiency symptoms occurred at pH levels approaching 7, and became increasingly severe at higher values. The percentage and total amount of boron in plant tops decreased as the pH of the soil increased. Of the four hydroxides tested, that of magnesium caused the greatest reduction in the availability of soil boron. Calcium, sodium, and potassium hydroxides had lesser effects, in the order named. In a study of the distribution of boron in cauliflower plants grown on Dunellen sandy loam, it was found that:—Applications of 5 or 10 pounds of borax per acre overcame boron deficiency, but 20-pound applications resulted in toxicity. Boron consumption by plants increased when additional quantities of borax were added to the soil. The expressed juices of plants contained much less boron than the remaining plant residue. The boron in plant residues from which the juice has been pressed is insoluble in cold water and in alcohol, but is appreciably soluble in hot water and completely soluble in 2% hydrochloric acid solution. [Author's summary.]

26. BOUYOUCOS, G. J., AND MICK, A. H. 631.432

An electrical resistance method for the continuous measurement of soil moisture under field conditions.

Tech. Bull. Mich. agric. Exp. Stat. 172, 1940, pp. 38.

This great advance on previous electrical methods of soil moisture measurement uses standardized porous plaster of Paris blocks containing tinned electrodes and buried at the required point in the soil. The moisture in these blocks comes to equilibrium with that of the surrounding soil and the resistance of the block is measured by a portable alternating current bridge operating at high frequency. Previous difficulties of unstable contacts and electrolysis are thus overcome. Laboratory tests showed that soil salt concentration variation caused negligible errors, and changes of resistance due to temperature variation can be corrected. The sensitive range includes from field capacity to wilting point. Resistance changes are relatively small between saturation and moisture equivalent and become very great as the wilting point is approached. Laboratory calibration on samples is necessary for translation to moisture percentages, and accuracy to $\pm 1\%$ in terms of soil moisture is claimed. Curves for typical soils are given. The resistance at wilting point is usually 60,000 to 75,000 ohms. Readings in the field can be taken in 20 to 30 seconds. Examples of use in the field under soybeans, fallow, and at 5 ft. and 20 ft. distance from the bole of "a large apple tree" are given. The latter showed much water usage at 5 ft. distance, apparently passing the wilting point between 24 in. and 48 in. deep continuously from August to November, but little at 20 ft. Measurements and specification of the blocks are not given, but the address of a firm* supplying both blocks and portable bridge is noted. This apparatus should be valuable to investigators, especially as its most accurate range is above the limit recorded by soil moisture tensiometers. (See *H.A.*, 7 : 579 and 6 : 424.)

W.S.R.

* Wood and Metal Products Co., Bloomfield Hills, Michigan, U.S.A.

27. MASON, T. G., AND PHILLIS, E. 581.11 : 633.51

Concerning the upward movement of soil solutes.

Ann. Bot. Lond., 1940, 4 : 765-71, bibl. 8.

1. An experiment is described [with cotton plants] in which the uptake of nitrogen and bromine by the root and their subsequent distribution throughout the plant in normal plants is compared with that in plants in which the continuity of the wood was broken at the base of the stem. 2. The supply of water to the foliage region of the "cut-wood" plant was ensured by a side root, grafted into the stem above the break in the wood. 3. The uptake of nitrogen and bromine by the roots was greatly reduced as a result of cutting the wood. 4. All the nitrogen absorbed by the root of the normal plant travelled into the foliage region, while 79% of that absorbed by the "cut-wood" roots did so. 5. 76.5% of the bromine absorbed by the normal plant travelled to the foliage region, while only 18% of that absorbed by the "cut-wood" plant did so. 6. It is concluded, at least in the case of nitrogen, that this element may travel upwards in the bark at rates comparable with those which occur in the intact stem. [Authors' summary.]

28. NEWHALL, A. G. 631.588.1 : 631.462

Experiments with new electric devices for pasteurizing soils.

Bull. Cornell agric. Exp. Stat. 731, 1940, pp. 38, bibl. 55.

Practical tests indicate that a final soil temperature of 65° C. is high enough to ensure pasteurization against all important soil pathogens and most weed seeds. A number of devices for indirect soil heating were tested. It was found that ordinary soil heating cable could not stand the temperature needed for soil pasteurization. A description is given of an induction type of electric pipe grid used more or less successfully. Soil in the greenhouse and in frames was brought to pasteurizing temperature with a series of buried, portable pipe-type heaters of $\frac{3}{4}$ galvanized pipe, having a rating of about 100 watts per linear foot and spaced to give 220 to 400 watts per cubic foot of soil. It was found possible with the Nixon electric dairy utensil steamer to obtain pasteurizing temperatures in soil pans at an expenditure of about 1.37 kilowatt hours per cubic foot of soil treated. A portable electrically operated, inverted steam pan gave promise as a means of treating cold frame, hot bed cutting bench, seed bed and similar soil *in situ*. With it pasteurizing temperatures were obtained to a depth of 7 to 10 in. in 2 hours with an expenditure of about 1.5 kilowatt hours per square foot of soil. A continuous or semi-flash type of electric soil pasteurizer was tested, wherein the soil was placed in a hopper at one end and discharged 5 minutes later from the other end, having attained a temperature of 65° to 80° C., at an expenditure of 1.5 kilowatt hours per cubic foot of soil treated.

29. BEATY, H. H., AND THOMAS, W. A. 631.588.1

Electric motors for the farm.

Bull. Iowa agric. Exp. Stat. Ext. Serv. P13, 1940, pp. 364-90.

The bulletin is devoted to single phase alternating current electric motors and their many uses on the farm. A considerable part of it concerns hints on running and on overcoming the various troubles to which such motors are liable.

30. NEW ZEALAND DEPARTMENT OF AGRICULTURE, FIELDS DIVISION. 631.543.83 : 631.588.1

Electric fencing.

N.Z. J. Agric., 1940, 61 : 19-36, 115-23.

The experience of a number of farmers who have made use of electric fencing for the control of stock and the exclusion of wild animals such as deer are given. There are also full accounts of how to construct this fencing. An electric fence, it is stated, is very much cheaper to erect than the standard wire fence, since fewer strands are needed. The cost of running the batteries amounts to only a few shillings a year.

31. MCRARY, W. L. 581.3 : 581.13

Nitrogen metabolism of the plant embryo [in the lupin].

Bot. Gaz., 1940, 102 : 89-96, bibl. 5.

LIVINGSTON, R., AND FRANCK, J.

581.13 : 581.144.4

Assimilation and respiration of excised leaves at high concentrations of carbon dioxide.

Amer. J. Bot., 1940, 27 : 449-58, bibl. 31.

- STILES, W., AND SKELDING, A. D. 581.13 : 631.83 + 631.811.9
The salt relations of plant tissues. I. The absorption of potassium salts by storage tissue. II. The absorption of manganese salts by storage tissue.
Ann. Bot., Lond., 1940, 4 : 329-63, bibl. 31 and 4 : 673-700, bibl. 17.
- DRIESSEN, F. C. 631.8
 De bemestingsleer en hare evolutie in den loop der eeuwen. (**The theory of manuring and its evolution through the centuries.**)
Bergcultures, 1940, 14 : 1192-9.
- CORNISH, E. A. 581.084 : 519
The estimation of missing values in incomplete randomized block experiments.
Ann. Eugen. Camb., 1940, 10 : 112-8, bibl. 8.

TREE FRUITS, DECIDUOUS.

General.

32. SOUTH AFRICA, UNION OF. 634.1/8 : 382.6
Fruit production in the Union. Report No. 21. The 1936-37 deciduous fruit export season.
Bull. Dep. Agric. S. Afr. 209 (*Horticulture Series* 2), 1940, pp. 43.
- This report, a supplement to No. 20 [noted *H.A.*, 9 : 1067], gives additional observations on the ripeness and ripening of fruit in S. Africa in the 1936-7 deciduous export fruit season.
33. PRETORIUS, W. J., PRINSLOO, A. L., AND DE WAAL, P. E. 634.1/8
An economic survey of certain aspects of the deciduous fruit industry in the Western Cape Province 1937-38.
Fruit Invest. Rep. Dep. Agric. S. Afr. 2, 1939, pp. 104.

Fruit growing in the Western Cape Province is going through a very difficult time. The authors make here a careful survey of the position from the economic standpoint and their report must be of value not only to this particular area but also to any similar districts where there has been too rapid expansion based on the receipt of good prices for small quantities. Among the requirements which they think necessary for setting the industry on its feet the following might well apply to similar districts:—(1) A greater measure of co-operation between fruit farmers. (2) A stronger organization with a definite policy. (3) Better co-ordination between the various branches. (4) Better marketing of fruit overseas as regards method of sale, method of distribution and method of controlling selling price. (5) Decrease in costs incidental to marketing overseas. (6) More support for development of new overseas markets. (7) Better regulation of supplies to local markets (better not to flood market with inferior stuff, as is present habit). (8) Reorganization of local market. (9) Better short-term credit facilities. (10) Greater use of co-operative facilities for collective buying of farming wants. (11) More efficient production, (a) by revision of varieties and kinds of fruit grown, (b) by using only rightly named stock, (c) by quick replacement of failures in field, (d) by better pest and disease control, (e) by more general use of irrigation. (12) Better book-keeping.

34. BAGENAL, N. B. 634.1/7
Fruit growing for small gardens.
Country Life Home Front Series 5, 1940, Country Life Ltd., London, W.C.2, pp. 30, 6d.

In wartime with imports of fruit necessarily curtailed, the householder with a small or large garden must realize the advantages, in fact necessity, of growing his own fruit. The problem is what to plant and how. The advice given in this small booklet, based on scientific knowledge and practical experience, goes far towards solving the problem. Briefly the subjects dealt with are:—planning and planting including lay-out; choice of apples and pears, form of tree, pruning and cultural care; choice of stone fruits and care of same; choice of and notes on preferable varieties of red currants, black currants, gooseberries, raspberries and strawberries and notes on cultivation; finally common pests and diseases and notes on spray materials.

35. HOWARD, W. L. 634.1/8
Home fruit growing in California.
Circ. Calif. agric. Ext. Serv. 117, 1940, pp. 95, bibl. 22.

This bulletin contains the essential information which should enable an amateur to produce good fruit in California. Suggestions are made of varieties suitable for the various districts. The results of modern research are well brought out.

36. GROH, H., AND SENN, H. A. 634.2
Prunus in Eastern Canada.
Canad. J. Res., 1940, 18, Sec. C, pp. 318-46.

A key is presented for the determination of native and naturalized species of *Prunus* in Eastern Canada, with a detailed citation of the distribution from herbarium specimens and Canadian Weed Survey records, the ranges of the more important species being mapped. The native *Prunus* are of economic importance since they serve as secondary hosts for leaf hoppers and aphids, vectors of virus diseases. It is not considered that naturalized and cultivated species are of any great significance in disease transmittal.

37. JOHNSTON, S. 634.25
The Redhaven peach.
Quart. Bull. Mich. agric. Exp. Stat., 1940, 23: 93-5.

A description of a new peach originating at the South Haven Experiment Station from the cross, Halehaven × Kalhaven. Its chief asset is as an early peach to fill the gap before Elberta, maturing a month earlier than the latter.

38. BRANSCHIEDT, P., AND JAHN, A. 634.25: 581.45
 Die morphologische Beschaffenheit des Blattrandes und der Blätter von Pfirsichsorten II. **(The morphological characters of the leaf margin in different peach varieties.)**
Angew. Bot., 1940, 22: 54-79.

A previous study of the morphological characters of the leaf edge in 32 varieties of peach, by Jahn (*Ibidem*, 1936, 18: 27; *H.A.*, 6: 673) showed the value of these characters in the determination of varieties. In the present paper, the results of a study of 37 other varieties are given in detail. R.M.I.

Propagation.

39. WHITTAKER, E. C., AND THORNELL, S. A. 631.541: 634.22
The grafting of prunes.
Agric. Gaz. N.S.W., 1940, 51: 336-9, 346.

The most successful time for working over unprofitable prune trees is in July (mid-winter) at Young, New South Wales. The tree should be headed back to 2 ft. above the fork and the scions inserted by means of bark grafts. At this height the raw cuts heal quickly and little bearing wood is lost. The trees should be headed just prior to grafting and not some time in advance. The latter practice makes it necessary to resaw the stubs before grafting and tends to tighten the bark abnormally and much past the stage when it might have been stripped with reasonable ease, allowing for time of year. Experiments at Young showed no difference in "take" growth or degree of callusing between one- and two-year-old scions. One-year-old scions, however, are easier to handle. A paper collar is placed round the top of the grafted limb so as to project about 2 inches above the edge of the cut. A small quantity of moist earth is tamped down inside the paper and over the cut surface of the limb. The only advantage of papering seems to be to prevent wind damage to the scion during early growth; unpapered grafts took equally well. If the tightness of the bark hinders the placing of the scions in position, a small piece of wood cut to the approximate size of the scion may be used to force an entry.

40. WHITTAKER, E. C., AND THORNELL, S. A. 631.541: 634.23
Timely advice on grafting cherries.
Agric. Gaz. N.S.W., 1940, 51: 331-6.

In re-working old trees an essential factor in success is to do it at the right time, i.e. when the stock trees are quite dormant. In such cases 100% take is not unusual, but if later success will diminish in proportion to the advance of growth. Two forms of graft, bark and cleft, are

described and illustrated. The bark graft is advised as being fairly foolproof; the cleft graft, though satisfactory as regards take, is often the cause of the start of wood rot through water soaking into the cleft, especially in large trees. Bark grafts are liable to wind damage for the first year or two, but precautions such as lightly topping the new growth during the first season or tying the scion to a stake lashed to the limb will more or less counter this. In bark grafting the scion in cherry and all other fruits should not be pushed home beyond the extent of its cut surface or callusing will be retarded. A shouldered cut on the scion which will catch on the outer edge of the stock stump will ensure a correct level. These scions should be inserted 3 on a 2½ inch stump or 4 on a 3 inch and so on. They will not all be needed eventually but their presence makes for rapid callusing which is important in the case of cherry. The whip and tongue graft for small branches or rootstocks should be used. An illustration is given. It is not advisable to head large trees for grafting farther back than the point where the diameter of the limb exceeds 4 inches. The ordinary bark side grafts used in refurnishing apples are not suitable for stone fruits owing to the time of year when the work should be performed, and chisel or plug grafting is unsatisfactory as regards take.

41. PROVAN, J. L., AND GREATOREX, F. J. 634.1/7-1.541.6
Invigorating fruit trees by inarching.
J. Dep. Agric. Vict., 1940, 38: 366-8, bibl. 1.

The method of invigorating older trees by inarching with a vigorous rootstock is described. The method consists of planting the new stock close to the tree to be treated, cutting the former back to 12-18 inches above soil level and inserting the cut end under the bark of the established tree either by the inverted T method or by inlaying. Both systems are described in detail. In each the graft is held in place by a brad or it may be tied. In the latter case the tie must later be cut. The union is sealed with grafting wax. If the new stock produces shoots these should not be removed until after the first year although they may be shortened. The stock, being planted very close to the tree, should be watered occasionally for the first two years or it may suffer from drought, and light cultivation of the immediate soil area should be given. Three stocks per tree should be used, distributed equally round the trunk.

Rootstocks.

42. BEAKBANE, A. B. 634.11-1.541.11: 581.144.2
Anatomical studies of stems and roots of hardy fruit trees. III.* The anatomical structure of some clonal and seedling apple rootstocks stem- and root-grafted with a scion variety.
J. Pomol., 1941, 18: 344-67, bibl. 17.

Anatomical studies were made of transverse sections of the rootstocks of 77 Lane's Prince Albert stem- and root-grafted on E.M. clonal stocks Nos. IX, II and XII and on seedlings from a commercial source. After two years, anatomical differences were observed between different clonal rootstocks whether stem- or root-grafted, different individual seedling rootstocks whether stem- or root-grafted, the rootstocks and scion variety, stem and root of the same rootstock when grown in normal position as regards ground level, and stem of same plant when grown above and below ground, root of the same plant grown above and below ground. Preliminary microchemical tests indicated that Nos. IX and II had more starch present than No. XII and in tissue grown below ground than in tissue grown above. More fats and oils may occur in Nos. IX, II and XII than in the seedlings. Nos. IX and II may contain more oxidases and peroxidases than No. XII or the seedlings. Tissue grown above ground may contain more tannin than that grown below.

43. NORTH-EASTERN STATES, U.S.A. 631.541.11: 634.1/2
Report of the 4th Annual Conference ["1940 Rootstock Conference"]
of fruit tree workers of the N.E. States held at Geneva, N. York,
July 31-August 2, 1940, pp. 13 (stencilled).

Many aspects of deciduous rootstock work were discussed. It was decided that special attention should be given at the next meeting to circumferences and other measurements for dwarfing

* I. *A.R. East Malling Res. Stat. for 1935*, A5, 1936, pp. 100-6; *H.A.*, 6: 446. II. *J. Pomol.*, 1939, 17: 141-9; *H.A.*, 9: 782.

rootstocks. In addition to the N.E. States, Ontario, Michigan, Virginia and the U.S. Department of Agriculture were represented. R. H. Suds, Department of Horticulture, West Virginia University, Morgantown, W. Va., was secretary.

44. DE WET, A. F. 634.25-1.541.11 : 634.22
Peaches on plum roots.
Fmg S. Afr., 1940, 15 : 263-5.

At Stellenbosch-Elsenburg College of Agriculture, Transvaal, yellow peach seedlings and Marianna, Methley and Myrobalan B stocks raised from cuttings were budded in 1936 with a variety of peaches. With all the combinations tested the peach stocks gave better results than the plums. There were many striking differences in the various combinations at the graft unions. Some of these are illustrated. On peach roots the union usually became smoother with age, on plum the peach scion showed excessive thickening at the point of union. Die-back on plum was very much worse than on peach stocks. In general, results followed those obtained in Europe and U.S.A.

Pollination.

45. JOHN INNES. 634.1/2 : 581.162.3
The fertility rules in fruit planting.
John Innes Leaflet, 4, 1940, pp. 8.

In this leaflet are given lists of (1) sweet cherries, (2) sour and duke cherries, and (3) plums, so grouped that the individual English grower need only choose varieties from the different groups in order to ensure adequate pollination—given, of course, satisfactory other conditions. The apples are set out according to whether they are triploid or diploid and the pears according to whether tetraploid, triploid or diploid. The necessity is urged when planting any triploid apple or pear variety to plant also 2 or 3 diploid varieties. Within the groups in all cases the varieties are marked as early, medium or late flowering.

46. MITCHENER, A. V. 638.14
The effect of color of hive covers upon the temperature within the hive.
J. econ. Ent., 1940, 33 : 649-50.

Experiments in the University of Manitoba, Winnipeg, showed that where galvanized metal tops were used for hive covers it was expedient to paint these with at least 2 coats of white paint to aid in reducing temperature within the hives on hot days. White paint was greatly to be preferred in its cooling effects to aluminium, black paint or no paint at all.

Growth and nutrition.

47. NAGASAWA, K. 634.13-2.19
Physiological studies of the effects of bagging upon the fruits of the Japanese pear. 5th Report. Influence of the size of bags on the development of corky lenticels. [Japanese.]
J. hort. Ass. Japan, 1940, 11 : 162-73, bibl. 11.

The author had previously found that bagging pear fruits tended to decrease the incidence of corky lenticels on them. As before in his experiments [*Ibidem*, 9 : 165-86, 10 : 221-41 ; *H.A.*, 10 : 60 and 880], the author used cellophane, hatron and newspaper bags for enclosing the growing fruits of the Japanese pears, Chojuro and Ako, this time using 3 different sizes of bag. He found that there was more development of corky lenticels in the cellophane bags than in those of the other two materials, but that the difference of effect diminished with increased size of bag. The conclusion is reached that the reason for the difference was lack of aeration in the cellophane bags and it is suggested that when bags are made of comparatively air-tight material, a small puncture in the base of the bag will effectively check corky lenticel development.

48. MACDANIELS, L. H. 581.47 : 634.11
The morphology of the apple and other pome fruits.
Mem. Cornell agric. Exp. Stat. 230, 1940, pp. 32, bibl. 32.

The author notes the value of a correct interpretation of the morphological nature of the parts of the apple fruit. The fact that different parts of the apple behave differently when stored is due to structural and chemical differences based on the basic nature of the parts concerned.

After a brief discussion of the receptacular theory of origin the author gives his reasons with considerable illustrated evidence for believing in the appendicular theory of origin. He summarizes as follows:—A review of the evidence on the interpretation of the morphology of the pome flower as largely receptacular or largely appendicular in nature, and a critical study of a number of pomaceous and other rosaceous genera, support the conclusion that the pome flower is appendicular in its derivation and structure. The appendicular interpretation is consistent with the comparative anatomy of the whole range of families, and with the nature of the inferior ovary generally. Phylogenetically the pome flower has arisen from the fusion, by adnation, of the fleshy rosaceous floral tube with the compound ovary. The floral tube, composed of the fused bases of the stamens, petals, and sepals, enlarges greatly as the fruit matures, and forms the larger part of the pome fruit. The so-called "core line" of the apple is interpreted as representing the line of fusion between the floral tube and the ovary. According to the appendicular interpretation, the fruits of the apple, the pear, and the quince are described as fleshy accessory fruits, made up of a five-carpelled ovary, with cartilaginous endocarp and fleshy exocarp, united with a fleshy floral tube or disk consisting of the fused bases of the sepals, petals, and stamens. Variation in pome structure is chiefly in the following characters: in the number of carpels, which may vary from 2 to 5; in the nature of the endocarp, which may range from bony in *Crataegus* and some other genera to cartilaginous; and in the degree of completeness with which the ovary is covered by the fleshy floral tube.

Manuring.

49. ANON. (BRITISH COLUMBIA). 631.8:633/635
Recommendations of the British Columbia Fertilizer Board.
 Published by authority of the Minister of Agriculture, Province of British Columbia, 1940, pp. 23.

General recommendations are given for manuring the different main crops grown in B.C. Those for fruit crops are summarized as follows:—Apples and pears (light soils) 6N-7P-10K or 6-10-10, 400-600 lb. being given; apricots, peaches, cherries and plums 6-10-10, 600 lb.; small fruits (1) strawberries 3-10-8 or 6-10-10, 500 to 750 lb., plus 16-20-0 (August 15), 100-200 lb.; (2) cane and bush fruits 5-10-5, 500-750 lb. These should be given in addition to dressings of the appropriate or available farmyard manure. The amounts suggested for vegetables are (1) on lowland soil 3-10-8, 750-1,500 lb., or 5-10-5, 750-1,500 lb. (2) highland 4-10-10 or 6-10-10, 1,500 lb. (3) peat and muck soil 4-10-10, 6-7-10 or 0-12-10, 750-1,500 lb. Vegetables are found to respond more definitely to farmyard manure than other crops.

50. HOBLYN, T. N. 634.11-1.8
Manurial trials with apple trees at East Malling, 1920-39.
J. Pomol., 1941, 18: 325-43, bibl. 10.

The history of two manurial trials with apple trees from the time of planting in 1920 to the end of 1939 is reviewed. The varieties used were Bramley's Seedling, Worcester Pearmain, Cox's Orange Pippin and Beauty of Bath on a range of clonal rootstocks. In general it was found that the nutritional requirements of different varieties vary, as do also those of the same variety on different stocks. The nitrogen and potassium requirements of Bramley's Seedling and Worcester Pearmain are different. Beauty of Bath required more potash than Cox's Orange Pippin, while the latter responded more readily to nitrogen. Bramley's Seedling on E.M. No. V rootstock suffered more from potassium deficiency than on I, the position being reversed in the case of Cox and Beauty of Bath. On No. IX Cox and Beauty of Bath deteriorated less rapidly from potash deficiency and recovered more rapidly after remedial treatment had been given than on other stocks. At East Malling, regular dressings of potash fertilizers are apparently needed by apple trees. Dressings of superphosphate or the omission thereof have produced no significant results. The amount of nitrogen necessary varies with the variety, rootstock, method of cultivation, age and cropping. This fertilizer must be carefully balanced with potash. On the soil where the experiment is in progress the remedying of a potash deficiency may result in interveinal leaf scorch symptomatic of magnesium deficiency which is less severe if the nitrogen:potassium ratio is sufficiently high. Trees on Malling stocks Nos. I, IV and VII are susceptible to interveinal scorch while those on IX, II, V and XII are resistant.

51. STARCHER, G. C. 631.8 : 634.1/2

Nine essential elements of proper tree fertilization.

News Lett. Ill. St. hort. Soc. 6, pp. 1-4.

A plea for the use of a fertilizer containing the following eleven elements, viz. nitrogen, phosphorus, potash, lime, sulphur, iron, manganese, magnesium, boron, copper and zinc, in the apple orchard. Two formulae are used, namely NPK in the proportions 6:8:8 and 10:6:4 to which small amounts of the other elements are added.

52. BRYDEN, J. D. 634.11-1.811.9 : 546.27

Effect of borax on green colour in Granny Smith apples.

Agric. Gaz. N.S.W., 1940, 51 : 525-6.

Soil applications of borax to correct boron deficiency have been found to enhance the desirable deep green colour in Granny Smith apples in cool storage. Fruit of borax-treated Granny Smiths which had been kept in ordinary store was mainly of a pale green, while the untreated controls were very variable, mostly in shades of yellow. Growth and development were the same in treated and untreated trees and no difference was observed in time of maturity.

53. COLE, C. E. 634.25-1.8

Manuring peach trees for profit.

J. Dep. Agric. Vict., 1940, 38 : 420-3, 430.

A series of experiments in the manuring of canning peaches carried out in Victoria have shown the importance of nitrogen in moderate quantities. The use of potash is not recommended on account of lack of response or that of superphosphate except as a dressing for the green manure crop.

Cultural practice.

54. ANON. 631.67 : 634.1/8

The importance of late summer irrigation for deciduous fruit trees and vines.

Mon. agric. Bull., Palestine, April 1940, pp. 110-3.

The advisability of late summer irrigation after harvest for deciduous fruits is not always recognized. Inadequate soil moisture after harvest causes early leaf fall to the detriment of bud formation and results also in the premature falling of flowers and fruit the next season and a reduced resistance to disease. This does not mean that a profuse vegetative growth, such as is engendered by over-irrigation, severe pruning, etc., in autumn, is desirable. Normal irrigation will not produce such results. In years in which the rains come early in autumn, when the soil is still warm, untimely blossoming and leafing will occur and this is developed from the reserves round the buds with consequent ill-effects on the normal flowering season. These difficulties will not arise if a satisfactory water supply has been maintained throughout the season and into the autumn. There is a definite relation between a low soil moisture content and the intensity of attacks by *Scolytis* (shot hole borer) and the best method of control is to ensure adequate irrigation of the trees.

55. VILJOEN, N. J. 631.874

The organic nitrogen content of cowpeas.

Fmg S. Afr., 1940, 15 : 368.

A very full summary is given of the results of a recent investigation* into the organic nitrogen content of cowpeas. The agricultural application of the result is as follows:—It was indicated that for green manuring the crop should be ploughed under when the first pods appear, while the most profitable time to cut the plants for hay is at the stage when the first pods begin to ripen.

56. McGRATH, J. V. 634.11-1.542

The pruning of Jonathans.

Agric. Gaz. N.S.W., 1940, 51 : 391-3.

Jonathan produces its fruit on 2-year-old laterals or on clusters of spurs, the laterals producing the better quality fruits. In the early stages laterals required for the development of the framework should be cut back to the last satisfactorily developed bud towards the base of the lateral, which will usually be about 6 inches from the base of the limb. Unlike many other

* Botha, P. J. J., Goossens, A. P., Cornell, H. H., and Viljoen, N. J. A study of the organic nitrogen content of the cowpea at different stages of growth. *Sci. Bull. Dep. Agric. S. Afr. (Division of Animal and Crop Production)*, 177. 3d.

apples, the Jonathan will not develop a new shoot from the base if the lateral is cut off so as to leave only a small stub. When the tree is old enough to be allowed to fruit there will be a considerable number of laterals down the entire length of the limbs. These are selected 6-9 inches apart and are lightly tipped (a necessary precaution against powdery mildew to which Jonathan is very susceptible). The remaining laterals are shortened back to the last satisfactorily developed bud towards the base of the lateral. The following year the laterals selected the previous year will have developed fruit spurs along their length and probably a lateral from the terminal bud. Those laterals which were shortened will have developed shoots from the buds on the portion left. The 2-year-old spurred laterals are now shortened in accordance with the strength of the lateral and the number of fruit spurs developed. As in the previous year a selection of laterals 6-9 inches apart should be made and only lightly tipped, the remainder being cut back as previously described. The subsequent year's pruning will consist of hard cutting back of those laterals that have fruited in order to force out fresh laterals from their base. No laterals should be left that exceed the height of the leader or the growth of the latter may be severely retarded. Thus in pruning a bearing tree, the crop for 3 seasons has to be considered.

57. KILPATRICK, D. T. 634.11-1.542
The pruning of Rome Beauty apples.
Agric. Gaz. N.S.W., 1940, 51 : 387-90.

Describes a system of long pruning for dealing with the peculiarities of Rome Beauty apple. The result aimed at in average-sized trees is (1) an inside tier to consist of about 15 leaders, no crotch higher than 4 or 5 feet, the leaders to be staggered ; (2) an outside tier of approximately 9, chiefly single secondary leaders developed from attachments not higher than 30 inches from the ground. Rome Beauty does not bud out well when normal lateral pruning is practised, the terminal bud alone is often the only one of any use. Laterals up to 6 or at most 8 inches may be left unpruned. More vigorous laterals are cut to 4 inches the first year to provide a foundation on which to head the spur proper. The following winter growths from the 1-year-old laterals are cut to 2 inches. When these extensions have once been induced to spur, fruitfulness quickly follows and the series of fruit buds is maintained. Short growths should on no account be tipped. Advice is given for dealing with the several types of growth which may arise.

SMALL FRUITS AND VINES.†

58. BEAKBANE, A. B. 634.71
Studies of cultivated varieties of *Rubus* and their hybrids. *II. Description and selection of clonal races of some cultivated blackberries and hybrid berries, including loganberries.
J. Pomol., 1941, 18 : 368-93, bibl. 11.

Detailed botanical descriptions of Loganberry, Phenomenal Berry and Laxtonberry and 47 variants, all of which had been brought from a nursery in a single batch of 160 as Loganberry, have been made over a period of 8 years. The characters recorded were very detailed and in more than one year involved 1,900 observations. The origin and history of Himalaya Berry, Black Diamond and Parsley Leaved blackberries, Loganberry, Phenomenal Berry and Laxtonberry are given and the selection of parents for clonal races described. Differences in botanical characters and in cropping between Loganberry variants are given. The results of a survey of a number of commercial plantations in which blackberries and hybrid berries are grown are presented. In 21 plantations in which the plants had been sold to growers as Loganberries, 11 were entirely true to name and 10 were badly mixed with Phenomenal Berry, Laxtonberry and Loganberry variants. Comparative trials of (1) 2 forms of Parsley Leaved blackberry A and B and (2) Himalaya and Black Diamond are described. Parsley Leaved A and Black Diamond proved superior in cropping.

59. WILLIAMS, C. F., AND DARROW, G. M. 634.711
The trailing raspberry—*Rubus parvifolius* L. Characteristics and breeding.
Tech. Bull. N. Carolina agric. Exp. Stat. 65, 1940, pp. 13, bibl. 4.

The trailing raspberry, *Rubus parvifolius* L., of Japan and Korea has been recently reintroduced into cultivation in America and is proving of interest for hybridizing with red raspberry varieties.

* *A.R. East Malling Res. Stat. for 1932*, A16, 1933, pp. 68-72 ; *H.A.*, 3 : 166.

† See also 144.

The hybrids exhibit vigour, disease resistance, productivity, good flavour and fair firmness. The greatest difficulty is lack of full fertility which affects both the size of the fruit and its cohesion, by reason of reduced number of drupelets. Attempts to improve this fertility by doubling the chromosome numbers are being made.

60. DARROW, G. M., AND MORROW, E. B. 634.75
The Massey strawberry.

Bull. N. Carolina Exp. Stat. 327, 1940, pp. 3.

A new mid-season strawberry suitable for North Carolina is described. It has been named Massey (NC No. 613) and is a cross between U.S.D.A. No. 634 and Blakemore. U.S.D.A. No. 634 is a cross between Royal Sovereign and Howard 17 (Premier). It is claimed that this fruit has beauty, size and firmness and maintains its high dessert quality for several days under conditions in which other varieties do not.

61. SATTERFIELD, G. H., AND YARBROUGH, M. 577.16 : 634.75
Varietal differences in ascorbic acid content of strawberries.
Food Res., 1940, 5 : 241-5, bibl. 26.

Tests by the Bessey and King method modified by Musulin and King and by Mack and Tressler on 7 American varieties of strawberry, Fairmore, Fairfax, Southland, Dorsett, Blakemore, Klondike and Missionary, at Raleigh, N. Carolina, showed that there are considerable varietal differences in ascorbic acid content. The average content of Fairmore (highest value) was 79% greater than that for Missionary (lowest value). On the average strawberries are at least equal to oranges in ascorbic acid content and 20-30 strawberries daily should satisfy human requirements in ascorbic acid.

62. REITER, R. 634.8
 Steiermarks Wein und Reben. (*Viticulture in Styria*.)
Angew. Bot., 1939, 22 : 414-20.

A brief account of this vine-growing district of Austria ; its climate and cultivation, varieties of grapes grown and the type of wine produced. R.M.I.

63. OINOUE, Y. 634.8 : 581.44 : 581.145
Intensity of fruit bud distribution on two distinct types of grape vine cane, karizuru and dobuzuru. [Japanese, English summary.]
J. hort. Ass. Japan, 1940, 11 : 146-9.

In Japan two types of cane are distinguished in the grape vine, namely, karizuru and dobuzuru. The former is cylindrical, with shallow grooves, high-noded with large buds and tendrils, rather definitely zig-zag in shape, definitely striped, dark coloured, smooth, with much bloom, of hard texture. The latter is flattish, deeply grooved, low-noded with comparatively small leaves, straight in shape, indistinctly striped, of rough surface, pale coloured, without bloom, soft-textured, with very small and slender tendrils. When occurring in a not very productive *vinifera* the dobuzuru produces very little crop. In Japan Sultanina and Monukka tend to produce this type of cane. In the Bellino variety karizuru produced 86% fruitful buds as against dobuzuru 16%. With Sultanina dobuzuru produced no fruitful buds. Dobuzuru cane is less frost-resistant, roots only with difficulty from cuttings and perpetuates its qualities when grafted in other stocks.

64. OINOUE, Y. 634.8-1.542.21
Influence of early shoot pinching in the grape vine on the setting of berries and certain histological and biochemical changes in the shoot pinched.
 [Japanese summary.]
J. hort. Ass. Japan, 1940, 11 : 141-5, bibl. 6.

The author used in his experiments 5 Muscat of Alexandria vines worked on Berlandieri Riparia Oinoue No. 14 (Berlandieri Lességuier No. 2 × Berl. × Riparia 420A) and tested the effect of pinching back the growing tips at different dates before and after flowering. The date at which the operation was most efficacious in promoting set of fruit was 5 days before flowering. It had little or no effect when done more than 15 days before flowering or after flowering. A rapid

increase in carbohydrate and nitrogen content was apparent shortly after pinching. This rose for about 5 days, to fall again to approximately normal about 15 days afterwards.

65. PENMAN, F., HUBBLE, G. D., TAYLOR, J. K., AND HOOPER, P. D. 631.4 : 634.81-1.67

A soil survey of the Mildura Irrigation Settlement, Victoria.

Bull. Coun. sci. indust. Res. Aust. **133**, 1940, pp. 75.

The Mildura Irrigation Settlement of 17,150 acres of mallee country on the Murray River in North-West Victoria is particularly important as a pioneer and successful irrigation settlement and as a controlling influence on the development of the Australian dried fruits industry. Some 10,800 acres carry vine or tree crops, sultanias being the chief planting. As a result of the survey it appears that all soil types are capable of satisfactory production of vine fruits under good management, apart from the incidence of salt and waterlogging problems.

66. BEYERS, E. 634.872-2.19-1.67

Note on the effect of irrigation on drop berries and desiccation of stalks in Waltham Cross grapes.

Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940, pp. 64-6.

Tests at Paarl show clearly that irrigation of Waltham Cross vines liable to suffer from drought definitely reduces the susceptibility of the grapes to drop berry and desiccation of stalks in storage.

67. BEYERS, E. 634.872-2.19-1.542.24

Girdling grape vines, with special reference to "drop berry" in Waltham Cross.

Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940, pp. 60-3, bibl. 5.

Girdling fruit canes a month after flowering markedly reduced susceptibility of Waltham Cross to shedding, this advantage being clearly shown when the fruit was exposed to relatively unfavourable storage conditions. Evidently the temporary check on the movement of assimilates downwards enhanced nutrition and stimulated growth in the girdled canes, resulting in strengthening of the vascular strands passing from pedicel to berry.

PLANT PROTECTION OF DECIDUOUS FRUITS.

68. ANET, H. 546.27 : 632.19

L'action du bore sur les végétaux et son rôle dans les maladies physiologiques ou de carence des arbre fruitiers. (Boron and plant diseases.)

Rev. hort. suisse, 1940, **13** : 214-21.

The effects on fruit trees of boron deficiency in the soil is described with the aid of a number of excellent photographs. Some of the author's own experiences in the rejuvenation of apparently dying apples and pears by the application of borax are discussed. The pear, Beurré Giffard, appears to need more boron than other varieties. Varieties of apple subject to *coulure* (the untimely drying up of the flowers) and to deformed fruits were cured of this habit which had persisted for 10 years by the application of borax to the soil at the rate of about 4 grammes per square metre.

69. CHITTENDEN, E., AND THOMSON, R. H. K. 664.85.11-2.19 : 546.27

The effect of borax on the storage quality of Jonathan apples.

N.Z. J. Sci. Tech., 1940, **21** : 352A-6A, bibl. 2.

Previous work had shown that internal breakdown in Jonathan apples stored at 38° F. for 6 months was greatly increased by borax applications of 1 lb. to 3 lb. per tree [*Ibidem*, 1938, **19** : 541-6 : *H.A.*, **8** : 398]. Further experiments showed that the carry-over effect of the 3 lb. top-dressing was still to increase the amount of internal breakdown in Jonathan apples stored at 38° F. for nine months. Trials of the incorporation of borax sprays at 0.1%, 0.15%, and 0.25% in ordinary spray mixtures showed no harmful results from this action.

70. ANON. 634.11-2.19 : 546.27

Boron lack is cause of apple ills.

Bett. Fruit, 1940, 34 : 12 : 16-9, reprinted from *Better Crops with Plant Food* (undated).

Although this paper merely covers familiar ground it does clearly describe and illustrate a number of deficiency troubles of apple, mainly those brought about by lack of boron, namely, drought spot, corky core and cork and internal cork, and the distinguishing symptoms of these are compared with those of bitter pit, a trouble which is not curable by boron applications. To control bitter pit it is suggested that there should be a reduction in the nitrogen applications and that the NPK ratio should be 2 : 2 : 1, excessive pruning in any one season should be avoided and an adequate moisture supply should be maintained. Heavy mulching in grass orchards has proved useful in this respect.

71. KIDSON, E. B., ASKEW, H. O., AND CHITTENDEN, E. 634.11-2.19-1.811.6

Magnesium deficiency of apples in the Nelson district, New Zealand.*

N.Z. J. Sci. Tech., 1940, 21 : 305A-18A, bibl. 9.

(1) Premature defoliation of apple trees in the Nelson district has been identified as a magnesium-deficiency ailment. (2) The symptoms of magnesium deficiency vary somewhat with different varieties, but the more characteristic features are brown blotching of the leaves, particularly between the veins, followed by defoliation. The older leaves of new leader growth are invariably affected, leaving a tuft of leaves at the tip of the leader. (3) Injection of magnesium sulphate into branches of affected trees prevented blotching of the leaves and defoliation [using Dr. Roach's methods, for which see *Tech. Commun. imp. Bur. Hort.* 10.—ED.]. (4) Chemical analyses of leaf samples collected from injected trees showed that the magnesium content of the leaves had been greatly increased by the injection of magnesium salts. (5) Analyses of a large number of leaf samples from healthy and affected trees in different orchards of the Nelson district showed that there was a good correlation between leaf blotching and low magnesium content of the leaves. (6) Premature defoliation of apple trees is most severe where liberal use has been made of potassic fertilizers. Leaf analyses reveal high potash figures in association with low magnesium content. (7) It seems probable that the liberal application of potassic manures on several leached acid soils of the Nelson district has developed an unfavourable ratio of available potassium to available magnesium in the soil and has thus reduced the intake of magnesium by the trees. [Authors' summary.]

72. RIVES, L. 634.8-2.19
 Sur le folletage. (**Apoplexy of vines.**)
Prog. agric. vitic., 1940, 114 : 3-7.

The reason for some particular cases of vine apoplexy, or sudden wilting of the branches of vines, sometimes of the whole plant, is discussed. This disease is non-parasitic and must not be confused with the *Stereum necator* disease, also called "apoplexie" in France. In the cases under consideration the direct cause was tylosis or the blocking of the sap-conducting vessels of the plant by the intrusion of parenchymatous nodules (*thylles*). High drying winds may cause this phenomenon since apparently the *thylles* form freely under the action of reduced pressure set up by excessive transpiration. However, *folletage* can occur without the presence of *thylles* in abnormal quantity, since the author has noticed cases in which the ascending moisture was checked by the presence of an abnormal number of gas bubbles in the conducting vessels, also attributable to excessive transpiration. Wilting occurs on wet cold soils as much as on dry because on the former the conditions check the sufficient intake of water. Some well-known rootstocks are easily influenced in this direction by imperfect soil conditions and fail to produce sufficient feeding roots. Formation of feeding roots is also checked by heavy cropping being permitted in the year of grafting. Such cases often result in a marked starch deficiency in the stem. Another possible cause is stock/scion incompatibility where this is marked by a swelling at the union. The condition of *folletage* may be combated by reducing transpiration by pinching back to two or three leaves above the last bunch, accompanied by a vigorous earthing up. Should pinching back fail, recourse must be had to pruning which is done either by suppressing all green parts on the leading shoots or on the lowest of the green

* Same article as that in *J. Pomol.*, 1940, 18 : 119 ; *H.A.*, 10 : 960.

branches carried on the last year's wood (*courson*). The former is to be preferred, since it allows of possible regrowth from dormant eyes of shoots which might be able to ripen during the remainder of the season.

73. REYNEKE, J., AND STUBBINGS, W. A. K. 634.13-2.19
Oil sprays in relation to the development of scald in Bon Chrétien pears.
Fmg S. Afr., 1940, 15 : 313-4, 324, bibl. 1.

An intensive spray programme of summer oil emulsion on Bon Chrétien pears retards the rate of development of the fruit on the tree, the pears thus maturing later than fruit sprayed with lead arsenate. The oil layer on the fruit totally prevented the incidence of scald or cold injury during storage at low temperature. The susceptibility to scald of pears sprayed with lead arsenate was increased by longer exposure in the acid trough, and to an even greater extent by the addition of a wetting agent, Areskap, to the acid solution. Oil-sprayed pears remained unaffected by any acid treatment except where Areskap was used, when susceptibility increased. The wetting agent is liable to remove the natural waxes from the fruit and seriously aggravate subsequent scald development. In view of recent findings the authors consider that it is becoming increasingly difficult to justify some of the spray programmes previously recommended. Fixed nicotine compounds as substitutes for lead arsenate have given very encouraging results. They permit the use of oil emulsion at any stage of the spray programme. The work was carried out at the Western Province Fruit Research Station and the Low Temperature Laboratories, Capetown.

74. BAWDEN, F. C. 632.8
The sizes of plant viruses.
Chron. Bot., 1940, 6 : 13-4.

A résumé is given of the modifications of ideas on the size of plant viruses which have occurred in the last 3 years and the reasons therefor. Tobacco mosaic virus, for instance, formerly thought to be one of the smallest, is now shown to be one of the largest, sufficiently long in fact to be visible under the microscope, and not resolvable solely because of its narrowness. The suggestion has been made that the particles occurring in infective sap are themselves aggregates and that the "molecule" of tobacco mosaic virus may be smaller than the figures given, but there is no positive evidence for this.

75. BEST, R. J. 632.8
Some effects of salicylate on plant viruses.
Nature, 1940, 145 : 627.

76. WORMALD, H. 632.482 : 634.1/7
The grey mould of fruit and some of its host plants.
Gdnrs' Chron., 1941, 109 : 44.

An eye rot of apples is associated with the presence of grey mould (*Botrytis cinerea*) on the calyx lobes. The occurrence of *Botrytis* on the dandelion, black bryony, bramble and sweet chestnut cupules is described. Strains isolated from these hosts were found by experiments to be able to infect apples. [Author's summary.]

77. MAIER, W., AND MITTMANN-MAIER, G. 634.23-2.4
***Monilia cinerea* Bon. als Erreger einer Blattkrankheit an Süßkirsche.**
(*M. cinerea* causes a leaf disease in sweet cherries.)
Angew. Bot., 1940, 22 : 79-86.

78. SIEGLER, E. A., AND BOWMAN, J. J. 634.23-1.541.41-2.42
Propagation of sour cherries by piece-root grafting to avoid spraying seedling stocks for leaf spot.
Phytopathology, 1940, 30 : 873-6, bibl. 15.

In U.S.A. the use of mazzard as a stock for cherry is unprofitable to the nurseryman on account of its susceptibility to leaf spot (*Coccomyces hiemalis* Higgins). Propagation of cherry on mazzard piece-roots would eliminate the necessity for spraying seedlings lined out for budding,

avoid the effect of unfavourable weather conditions on the buddings, protect the relatively tender seedling stock which would now be 6 inches below ground and encourage scion rooting. Trials showed that Early Richmond and Montmorency sour cherries could be satisfactorily grafted on mazzard piece-roots taken at the collar. Piece-roots taken lower down were less successful. Mahaleb piece-roots were less successful than mazzard. Sweet cherries were less successful than sour.

79. BEAKBANE, A. B. 634.71-2.48
Studies of cultivated varieties of *Rubus* and their hybrids. III.* A comparative trial of loganberry and phenomenal berry plants grown under different methods of training and spraying to control cane spot disease.
J. Pomol., 1941, 18 : 379-93, bibl. 11.

The trials have been in progress 5 years and are intended to study the comparative value for commercial purposes of (1) Loganberry and Phenomenal Berry, (2) 4 methods of training, (3) 2 spray treatments against cane spot (*Elsinoë veneta* (Burkh) Jenk.). It was found that Loganberry was more vigorous and bore a heavier crop but had smaller fruit and was far more susceptible to cane spot than Phenomenal Berry. Canning qualities were equal. Plants trained as a fan 6 ft. apart were smaller than plants trained in one direction 6 ft. apart on double wirework, or plants 12 ft. apart on single wirework or 12 ft. apart by weaving. (Diagrams are given of these methods. The crop per plant was highest in plants trained by weaving and lowest in those trained in one direction on double wirework. Cane spot infection was lowest on plants trained by fan and by weaving. Plants 6 ft. apart on double wirework were more affected than plants 12 ft. apart on single wirework. Spraying with colloidal copper in June reduced cane spot and in a succeeding year spraying in May with bordeaux mixture and in June with colloidal copper gave better results than spraying with colloidal copper in June only.

80. PEScott, R. T. M. 634.22-2.754
A capsid plant bug attacking stone fruits.
J. Aust. Inst. agric. Sci., 1940, 6 : 101-2, bibl. 7.

A note is given on the recent depredations of the capsid bug *Megacoelum modestum* Distant on cherries, nectarines and peaches at Baarmutha, in the north-eastern district of Victoria. Late Elberta peaches were the chief sufferers. The bug is identical with one recorded as damaging peaches and nectarines in New South Wales. It was then wrongly identified as *Dicyphus* sp.

81. KERR, T. W. 634.75-2.76
Arsenicals for controlling white grubs in strawberries.
J. econ. Ent., 1941, 33 : 693-6, bibl. 3.

The application of lead arsenate and sand at planting time to the roots of strawberries largely controlled the devastation made otherwise by the *Phyllophaga* spp. white grubs without affecting the lead or arsenate content of the strawberries harvested.

82. NEL, R. I. 632.77 : 634.1/7
Control of fruit fly in the Western Cape Province.
Fmg S. Afr., 1940, 15 : 304.

Mediterranean fruit fly *Ceratitis capitata* Wied.) can be satisfactorily controlled by poison baiting and thorough sanitation measures. The poison bait is compounded of sodium fluosilicate 1 oz., white sugar 2 lb., water 4 gallons, the mixture being applied as a spray with an ordinary garden syringe. It should be done once a month in winter and every 2 months in summer. Thorough reduction of the overwintering fruit fly population will ensure an adequate summer control. A large summer fruit fly population is very difficult to cope with. Infested fruit may be (a) burnt, (b) plunged in boiling water for 10 minutes, (c) immersed for 3 or 4 days in a carbolic dip of 1 part to 600 parts water, (d) immersed in cold water for 1 week, (e) placed in fly-proof trap pit. Feeding the fruit to pigs or poultry means that many maggots will escape and give rise to adults. Growers of deciduous fruits and grapes would find the infestation greatly reduced if they removed from the orchard or its immediate neighbourhood all kinds of miscellaneous fruit which provide breeding places when the deciduous fruits are not available.

* I. *A.R. East Mailing Res. Stat. for 1932*, A16, 1933, pp. 68-72; *H.A.*, 3 : 166. II. *Ibidem*, pp. 368-93; *H.A.*, 11 : 58.

83. HAEUSSLER, G. J. 634.1/8-2.78-2.96
Parasites of the oriental fruit moth (*Grapholitha molesta*) in Japan and Chosen and their introduction into the United States.
Tech. Bull. U.S. Dep. Agric. 728, 1940, pp. 62, bibl. 15.

This bulletin concerns the work done in 1932 and 1933 on the subject of parasites of the oriental fruit moth. Headquarters were at Yokohama and the work has continued since then both in Japan and Chosen. Results of these first 2 years show that the pest is the host of numerous species of parasites. Their individual incidence is here discussed at some length.

84. ANDERSON, C. 632.78
Ethylene dichloride checks borers.
Bett. Fruit, 1940, 35 : 4 : 5.

Ethylene dichloride emulsion has been developed by the U.S. Department of Agriculture to replace paradichlorobenzene as a soil treatment for peach tree borer on peaches, cherries, prunes and apricots. Advantages claimed for the former are that it is unaffected by low soil temperatures, is safer for the young tree, requires a minimum of soil preparation before treatment and no attention afterwards, costs less and is more effective. The emulsion is prepared with potash fish-oil soap and is applied by spraying or pouring on the trunk and the soil at the foot of the tree. Instructions are given for the dosages for various tree sizes.

85. ANON. (IMPERIAL INSTITUTE). 632.951
Plant insecticide materials from Empire sources.
Bull. imp. Inst., 1940, 38 : 150-63.

This paper contains a series of brief reports on samples of plant insecticide material examined by the Imperial Institute on behalf of various Governments of the British Commonwealth. Derris figures very largely, but mundulea, pyrethrum and tobacco are also included. A sample of *Chrysanthemum frutescens* from Tanganyika showed insignificant pyrethrin content compared with that of ordinary commercial pyrethrum flowers, *C. cinerariaefolium*.

86. REINICKE, V. 632.951
An economical dipping trough for fruit.
Fmg S. Afr., 1940, 15 : 418-9.

In view of the present unsatisfactory manner in which fruit is cleansed of arsenical spray residue by small growers who cannot afford a washing machine, the author describes a simple dipping trough and containers in which acid washing may be carried out effectively and easily. The method of construction, manner of working and the dipping solutions required are described.

87. GRIFFITH, M. 632.51
Experiment on the eradication of bracken by summer ploughing.
Welsh J. Agric., 1940, 16 : 227-9.

Experiments on a number of sites are described which indicate that ploughable bracken-infested land can be used for crop production, especially potatoes, immediately and the bracken reduced to negligible proportions by ploughing it in in July and August, thus preparing the way for a rotation of crops on this type of land.

88. PRUNSTER, R. W. 632.51
The control of cumbungi (*Typha* spp.) in irrigation channels.
 Reprinted from *J. Coun. sci. indust. Res. Aust.*, 1940, 13 : 1-6.

Eradication of *Typha* (bullrush or reed mace) from irrigation channels in Australia was best accomplished by cutting the plants at ground level and below water at intervals varying from 1 to 8 weeks. The frequency of cuttings depended on the depth of the channels. In a channel more than 15 inches deep 96% of the original population was killed with 6 cuttings at 6-week intervals; with a fluctuating water depth not exceeding 15 inches, 6 cuttings at 4-weekly intervals killed 88% of the plants. The population seems to decrease almost by geometric progression so that the work involved is decreased with each cutting. The physiological reasons for the death of plants under water following cutting are explained. Other methods such as chemical sprays were occasionally effective but were uneconomical. An account is given of the patrol system by which regular cutting was assured.

89. DAVIS, W. B. 632.693.2
Distribution and variation of pocket gophers (genus *Geomys*) in the south-western United States.
Bull. Tex. agric. Exp. Stat. 590, 1940, pp. 38, bibl. 8.

VEGETABLE GROWING.

90. CHISHOLM, J. S. 635.1/7
The cultivation of vegetable crops.

Edinburgh and East of Scotland College of Agriculture, 1940?, pp. 15, 3d.

A concise pamphlet dealing with the main points to be observed in the successful growth of the better known vegetable crops and the best utilization of the land devoted to them in gardens, allotments or the farm with special reference to conditions in the East of Scotland.

91. ANON. 635.1/7
Vegetable growing.

Country Life Home Front Series 1 (2nd edit.), 1940, Country Life Ltd., London, W.C.2, pp. 50, 6d.

A useful booklet giving a wealth of information on the production of garden vegetables.

92. BEWLEY, W. F. 635.1/7 : 631.544
Vegetable crops under glass.
Country Life Home Front Series 6, 1940, Country Life Ltd., London, W.C.2, pp. 31, 6d.

A successful attempt is made to outline the operations necessary for growing the more common English vegetables under glass. Instructions are given for the cultivation in glasshouses of tomato, cucumber, lettuce, dwarf and climbing beans, turnips, carrots, radishes, cauliflowers and spinach. Notes are included of cultivation under frames of a number of the above, both hot bed and cold frame, and a page is devoted to the use of cloches. Hints are added on soil and structural hygiene necessary for the growing of crops under these conditions.

93. THOMPSON, H. C. 614.014.44
Effect of temperature and length of day on growth of vegetables.
Minn. Hort., 1940, 68 : 163-4.

Exposure of celery seedlings to relatively low temperature, 40-50° F., for 10, 20 and 30 days increased the number of plants running to seed by approximately 8%, 44% and 74% respectively. Celery will flower under a wide range of day lengths, provided the temperature is favourable to the initiation and development of flowers. Experiments are described which show clearly that a relatively low temperature is essential for flower development in cabbage. In beets the type of growth is determined by temperature and length of day, of which temperature exercises most control. Applying this to breeding work it is found possible to select beets in the field during the growing season, pot them in the autumn and have them produce seed in time to sow the following spring. The temperatures and day lengths and photoperiods involved are the following : Hold the beets in a greenhouse at 40°-50° F. for a month after potting, then raise the temperature to 50-60° with additional light from sunset to 10 p.m. When the seed stalk appears raise temperature to 60-70° F., maintaining the extra lighting. Onions sets over $\frac{3}{4}$ inch in diameter often seed prematurely when planted in the field. Seeding can be reduced to a minimum by low temperature storage of the sets at 30°-32° F. Lettuce runs to seed at high temperatures. Increased day length does not hasten this but does hasten stem growth when the flower stalk has started. Spinach is shown to be a long-day plant. High temperature at early growth delays seed stalk development regardless of subsequent temperature and low temperature at early growth hastens seeding regardless of length of day and subsequent temperature. Thus spinach planted in spring is more likely to run to seed than spinach planted in summer. Carrots develop normally at medium temperature, 60°-70° F. At 50°-60° F. they develop poor colour and undue length for the variety ; at 70°-80° F. the roots are short and stubby for the variety. This explains the great variation in length of carrot of the same variety grown in different regions or in the same regions at different times of year. The experiments referred to in this paper were carried out in U.S.A. and Poland by a number of named investigators.

94. FOX-WILSON, G. 635.1/7 : 632.7
Some seasonal pests of garden vegetables and their control.
J. roy hort. Soc., 1940, 65 : 407-19, bibl. 15.

In this paper some pests attacking vegetables in early summer and the control measures to be taken are discussed. The pests mentioned are eelworms, slugs, aphids, caterpillars, beetles, flies. Emphasis is laid on the importance of clearing the ground of cabbage stumps, old potatoes, etc., which form breeding centres for the distribution of the pests in the following season.

95. WOODMAN, R. M. 635.1/7 : 581.084.2
The effect of the concentration of the culture solution on vegetables grown in sand.
Ann. appl. Biol., 1940, 27 : 445-52, bibl. 2.

Experiments were carried out at the Horticultural Research Station, Cambridge, to discover the optimum concentration of the sand or soil solution for certain vegetables. Six different solutions were used containing important nutritional elements in the same ratios to each other, although the total concentration of these elements varied. The best solutions for each of the vegetables grown, as judged by a statistical comparison of yields and by the general appearance and market ability are given. [From author's summary.]

96. GREEN, D. E. 633.491-2.4
Hygiene in the wartime garden. I.
J. roy. hort. Soc., 1941, 66 : 28-33.

The first of a series of articles in which the diseases affecting vegetables are to be discussed. This paper deals with potato dry rot (*Fusarium aceruleum*) scab, blight (*Phytophthora infestans*) and wart disease (*Synchytrium endobioticum*).

97. WALLACE, J. C., AND THOMPSON, J. K. 633.491-1.8
The placement of fertilizers for potatoes.
Kirton agric. J., 1940, No. 6, pp. 5-9.

Dr. Wishart reports on these experiments at Kirton, Lincs, that their accuracy was good and that the treatments showed no significant differences. The treatments were as follows:— (1) Broadcasting fertilizer uniformly over the ridges. (2) Applying it in the flat bottoms of the ridges. (3) Applying it in narrow bands on each side of the seed tuber, but about 2 inches deeper. (4) As in (3) but level with the seed tuber.

98. THOMPSON, J. K., AND WALLACE, J. C. 633.491-1.8
Investigation on the effect of artificial manure on the early growth of the potato.
Kirton agric. J., 1940, No. 6, pp. 9-16.

Field results confirm those from pot experiments. As a whole they suggest that under dry soil conditions a heavy concentration of fertilizer in close proximity to the potato set may retard growth and even reduce yields. Very heavy dressings applied in the bottom of the row may lead to poor results. The same effect may result from inefficient distribution of fertilizer.

99. SMITH, A. M., AND GILLIES, J. 633.491 : 577.16
The distribution and concentration of ascorbic acid in the potato.
Biochem. J., 1940, 34 : 1312-20, bibl. 15.

The concentration of ascorbic acid in the leaves fluctuates considerably during the day but shows a maximum value in the early forenoon; it is on the average much greater in the leaves than in the tubers. In the tubers it reaches a maximum in August and falls quickly as the plant ripens off. During storage the value decreases until, after 6 months, it is only about one-third of the value at the time of harvesting. Variations in normal manuring practice do not produce significant effects. There is usually a greater concentration in tubers from plants affected with severe mosaic or leaf roll than in tubers presumed to be healthy. The concentration of ascorbic acid increases from the heel to the middle or tip of the sprout; the gradient is more pronounced when sprouting has taken place in the light than when it has occurred in the dark. There is apparently no synthesis of ascorbic acid during the early stages of sprouting but rather a net loss which is greater when sprouting has taken place in the dark. [Authors' summary.]

100. MCKAY, R. 633.491-2.1

An unusual spotting of potato tubers and its cause.

J. Dep. Agric. Eire, 1940, **37** : 93-5.

Potato tubers of British Queen, forming part of an August digging, were found in December to exhibit severe lenticel spotting, the injury consisting of small spots penetrating to a depth of from 1 to 4 mm. The potatoes which were intended for seed were collected in clean tomato chips and stored in a loft. After many experiments it was concluded that the injury was due to rat excrement, chiefly urine. It is also shown that the excrement of rats may cause large circular depressed areas indistinguishable from the pit rot of Pethybridge,* though similar lesions undoubtedly occur in the entire absence of these pests. Little further has since been published on pit rot. The author produces reasons for thinking that it may be due to the absorption by the tubers of some toxic element in the clamp or pit. The most probable element, as Pethybridge showed, is ammonia.

101. FRIEDRICH, H. 633.491

Studien über den Einfluss von Jahreszeit und Lagerungstemperatur auf das Redoxpotential und die Azidität der Gewebebreie von Kartoffelknollen. (The effect of season and storage temperature on the reduction potential and acidity of tissue sap in the potato tuber.)

Angew. Bot., 1939, **21** : 361-73.

FRIEDRICH, G. 633.491

Untersuchungen über die Änderung des Redoxpotentials der Kartoffelknolle durch die Lagerungstemperatur. (Investigations into change effected by storage temperature in the reduction potential of the potato tuber.)

Angew. Bot., 1939, **21** : 374-82.

PLATZMANN, M. 633.491

Der Einfluss von Wachstumsbedingungen und Anbaumassnahmen auf Knollen und Stärkeertrag sowie den Speisewert von Kartoffeln. (The effect of growth conditions and cultivation on yield, starch content and nutrient value of the potato.)

Ernähr. Pfl., 1940, **36** : 16-8.

102. TAYLOR, H. V., AND JOHNSTONE, K. H. 635.1

Root vegetables.

Bull. Minist. Agric. Lond. **120**, 1939, pp. 17, 6d.

Details are given, in most cases with regard to supplies, varieties, cultivation, lifting and storage and marketing, of the following common root vegetables in the United Kingdom:—carrots, parsnips, turnips, swedes, beetroot, Jerusalem artichokes, salsify, celeriac, kohlrabi, skirrets (*Sium sisarum*). In one appendix particulars are given of the analyses of most of the above including vitamin content. In a second appendix the carrot import figures for 1938 are given.

103. OWEN, F. V., CARSNER, E., AND STOUT, M. 581.145 : 581.035 + 581.036 : 633.63

Photothermal induction of flowering in sugar beets.

J. agric. Res., 1940, **61** : 101-24, bibl. 12.

Photothermal induction of flowering is a new term used to signify induction of flowering by both heat and light. In beets the effect of photoperiod was found to be intimately associated with and dependent upon temperature exposure. The effect of low temperature exposure, favourable to subsequent flowering was demonstrated with germinating seed, with beets kept for a time in cold storage and with growing plants. Some of the factors that influenced bolting in the field acted indirectly by altering the range or duration of effective temperatures. Thus, shade increased bolting by lowering the temperature of the soil and consequently the temperature of

* Pethybridge, G. H. Investigations on potato diseases. (Tenth Report.) *J. Dep. Agric. Dublin*, 1918-19, **19** : 271-92.

the beet crown under conditions where the unshaded soil was too warm. Irregularity in germination of seeds under temperatures conducive to induction of flowering resulted in variation of bolting because of the fact that seeds retarded in sprouting escaped some of the low-temperature influence. Genetic variability in beets with regard to response to temperature and photoperiod was shown and a factor for bolting identified. The work was carried out by the U.S.A. Department of Agriculture. [From authors' summary.]

104. WHITEHEAD, T. 635.136

A summary of seven years' work on varieties of swede.

Welsh J. Agric., 1940, 16 : 99-110.

A classification of 12 popular varieties of swede is attempted, which takes into account their reaction to as many as possible of the factors of agricultural importance, such as yield of fresh weight to roots per acre, incidence of disease, yield of dry matter per acre, rate of maturation of roots and relative keeping power in storage.

105. MAYFIELD, H. L., AND RICHARDSON, J. E. 635.14 : 577.16

Ascorbic acid content of parsnips.

Food Res., 1940, 5 : 361-8, bibl. 9.

By the method described by Bessey and King, modified by Bessey, parsnips were found to be good sources of vitamin C in the autumn when cooked in different ways. They also proved a fair source of the vitamin when left in the ground till the spring.

106. HOARE, A. H. 635.25

Onion growing on the farm.

J. Minist. Agric. Lond., 1940, 47 : 163-6.

A concise account of growing spring or autumn sown onions under English conditions with notes on varieties, storage and marketing. Spring-sown crops under favourable conditions should average 6 tons per acre and autumn-sown crops more, up to 12 tons having been secured.

107. FIDLER, J. H. 635.34/36

Cabbages and related green crops.

Bull. Minist. Agric. Lond. 53 (3rd edit.), 1940, pp. 53, 1s. 3d.

Full details are given of the cultivation, harvesting and marketing of the following green crops in the United Kingdom:—Spring greens and cabbage, summer and autumn cabbage, savoy cabbage, brussels sprouts, cauliflower (summer and autumn), broccoli (autumn and winter). Much shorter notes are included on red cabbage and on cauliflowers for pickling, these crops being dealt with in a separate bulletin, and on sprouting broccoli, kale, Portugal cabbage and Chinese cabbage. The treatment of pests and diseases are not dealt with in detail, the reader being referred to advisory leaflets.

108. BURRELL, R. C., BROWN, H. D., AND EBRIGHT, V. R. 577.16 : 635.34

Ascorbic acid content of cabbage as influenced by variety, season and soil fertility.

Food Res., 1940, 5 : 247-52, bibl. 8.

In the 31 varieties or strains of cabbage tested in these trials the ascorbic acid content varied between .480 and 1.809 mm. per gram of fresh weight. The actual amounts varied according to season but the comparative levels remained the same as between varieties. There are indications that high nitrogen or complete fertilizer dressings give rise to higher ascorbic acid contents than other treatments.

109. PRYOR, D. E. 632.411 : 635.34/6

The effect of some mineral nutrients on the development of clubroot of crucifers.

J. agric. Res., 1940, 61 : 149-60, bibl. 18.

The percentage of susceptible club-rooted plants in sand cultures of turnip, mustard and cabbage was slightly increased over that in the complete nutrient solution by an abundance of potassium, more by an abundance of nitrogen and most by the absence of sulphur or nitrogen. The percentage was decreased markedly in plants deficient in potassium. A smaller proportion of plants of susceptible strains developed galls when grown in nutrient solutions in which sulphur

or nitrogen was withheld than was the case with resistant strains. No signs of clubroot appeared regardless of the variation in nutrient supply on the immune variety Purple Top Milan. Deficiency of sulphur lowered the sulphur oil content greatly while nitrogen starvation did not. The sulphur oils are apparently not essential in enabling the host to prevent or retard clubroot development in these tissues. [From author's summary.]

110. WETZEL, A. 635.35 : 631.8
Nährstoffentzug und Verlauf der Nährstoffaufnahme des Blumenkohls.
(Nutrient requirements of cauliflower.)
Ernähr. Pfl., 1940, 36 : 81-3.

Manuring experiments showed the importance of nitrogen and especially of potash for increasing the growth, yield and quality of the cauliflower. R.M.I.

111. SMETON, M. J., AND BROWN, W. 635.52 : 632.48
Botrytis disease of lettuce, its relation to damping-off mildew, and its control
by pentachloro-nitrobenzene dust.
Ann. appl. Biol., 1940, 27 : 489-501, bibl. 6.

At the Imperial Biological Field Station, Slough, the dusting of lettuce seedlings overwintering in frames increased the stand available in spring and also the number of survivals after planting out. The problem of carrying over lettuce seedlings in frames through the winter is discussed in relation to damping off, mildew and *Botrytis*. Talc as a filler is more efficient than lime, which is non-effective in the control of mildew. General recommendations for the dusting programme are given.

112. ANON. 635.24 + 635.32 + 633.492
Cultivation of the globe and the Jerusalem artichoke and sweet potatoes.
Mon. agric. Bull., Palestine, April 1940, pp. 104-10.

Globe artichoke (*Cynara Scolymus*). In Palestine the globe artichoke is grown only near Jerusalem. Its use could be extended. A deep, moist loam suits it and it responds well to manuring by increased tenderness of buds and number of flowering stems. It is propagated from offshoots taken with a piece of the parent root attached. This is done in the rainy season, the young plants are set out at once and should flower the same season. Full bearing, i.e. 3-4 dozen flower heads to a stool, does not occur till the 3rd year. After the 5th year it is more economic to break up the plants and replant their suckers. In Palestine planting distance is 90-100 cm. apart, usually along hedges or lanes. In U.S.A., planting is 3 metres apart to allow for intercropping. The lower heads are picked when well grown but before the scales open. The stalk is cut off at the base of the plant to encourage the production of offshoots. Demand is greatest in winter. To meet this the plants are cut down in June and July, with the result that flowering is postponed to September or October and continues until January. Late cutting back results in larger heads in winter. Cutting too early in June results in earlier and smaller heads. Spiny plants with reduced bearing power should be removed. The chief pests are aphids, *Myzus braggii*, the artichoke aphid, and *Aphis rumicis*, the bean aphid. Both are controlled by nicotine spraying.

Jerusalem artichoke (*Helianthus tuberosus*). Jerusalem in this case is possibly a corruption of the Italian *Girasole*.* It has long been grown in Palestine, but in 1934 an improved variety was introduced by the Department of Agriculture. The tubers have a high carbohydrate content. The sugar is mainly in the form of levulose and therefore a suitable diet for diabetics. Small tubers are planted in April at least 8 cm. deep, deeper if the climate is hot, spacing being approximately 120 cm. x 80 cm. Irrigation is necessary. The tubers will be ready for lifting when the stems wither in about 4-5½ months from planting. They do not store well but keep well in the ground and are lifted as required. Lifted tubers keep reasonably well if given a covering of earth.

Sweet potato (*Ipomaea Batatas*), though universally grown in the tropics and much of the sub-tropics, is only of recent introduction to Palestine. The food value equals that of the ordinary potato and it has the advantage of being a permanent crop that does not require an annual

* For full discussion of this see *J. roy. hort. Soc.*, 1940, 65 : 338 and 376.

importation of "seed" to maintain stocks. The most suitable climate is one with a growing period of at least 4 months combined with moderate rainfall, warm nights and plenty of sunshine. A wide range of soils are suitable but over-rich soils will induce vegetation at the expense of tuber formation. Good drainage is essential and ridge planting is advised. Some suitable crop rotations which include sweet potatoes are suggested. Manuring will greatly improve results. Propagation is by slips with roots attached which are pulled from the mother plant when 20 cm. in length. Vine cuttings are also used but chiefly as a means of quickly producing mother plants from which slips may be taken. Tubers for consumption grown direct from cuttings are said to be less marketable. Bedding sweet potatoes for slip production is done in early spring. The slips subsequently produced can be transplanted in time for a main crop to be harvested in mid-summer. Loss will be avoided in transplanting if the roots of slips for the field are dipped in a thin mud composed of cow manure and clay. Digging the crop begins in July and continues till December. A crop left in the ground for more than 5 months increases in weight by 15-20% for every extra month. Selection of plants for propagation should be done at harvest. The ideal tuber is medium-sized, well-shaped and should be taken from high-yielding, disease-free plants.

113. KAHARA, K., HAGIWARA, T., HAMADA, K., AND TAMURA, S. 635.31

A study of sex in young asparagus plantings. [Japanese.]

J. hort. Ass. Japan, 1940, 11 : 150-61, bibl. 13.

Work was carried out on the following line :—Six varieties of 2-year-old asparagus were examined as to their flowering percentages and sex ratios and, further, according to each sex, as to their flowering period, their condition of growth—particularly at the age of one full year—, the weight of underground parts of 2-year-old plants, the height of plant, number of stems, diameter of stem, length of stem, and the length between nodes. Further, the writers investigated the flowering percentages in the year of sowing, and the sex in 9 varieties of 1-year-old plants. 2. Some difference was noted among varieties of 1-year-old asparagus as regards the total weight, number of buds per plant, number of roots, and the length of the longest roots, but the writers could find no difference between the sexes in respect of these points. 3. An observation was made on 2-year-old plants with regard to flowering, and it was found that approximately 95% of the total number of plants of each variety flowered, their sex ratio being roughly 1 : 1. 4. Next the flowering time of 2-year-old plants was examined according to sex. In all varieties the male plants flowered earlier. The flowering percentage was worked out 15 days after the beginning of flowering. The result was that 65-76% of the flowering plants were male and only 22-29% female. 5. Further, 2-year-old plants were investigated at the end of their growth period as regards the following points :—height of plant, diameter of stem, length of stem, length between nodes, number of stems per plant, and weight of underground parts of the plant. No appreciable difference in these points was found among the varieties. But, as between the sexes, it may be said, generally speaking, that the female plants were superior to the male in height of plant, diameter of stem and length of stem. It is in the number of stems and the length between nodes that the male plants show superiority. As to the weight of the underground parts of the plant, nothing definite could be established. 6. There was a large difference in the flowering of 1-year-old plants among the varieties. The lowest figure was 2.7% and the highest 14.9%. However, it may be said on the whole that the male plants had a higher flowering percentage than the female. It is hoped that further experiments will be carried out shortly.

114. HOPKINS, J. C. F. 635.34/35 : 632.3

Diseases of fruit, flowers and vegetables in S. Rhodesia. 2. Black rot disease of cabbages and cauliflowers.

Reprinted from *Rhod. agric. J.* as *Bull. Minist. Agric. S. Rhod.* 1162, 1940, pp. 5.

This disease is caused by *Bacterium campestre* and is seed-borne. Notes are given on seed disinfection by heat or mercurial disinfectants.

115. QUINN, N. R. 635.63

Gherkin culture.

J. Agric. S. Aust., 1940, 44 : 77-81.

The requirements for successful cultivation of gherkins for pickling are a germinating temperature of not less than 50° F., warmth and moisture during the growing period, a suitable soil, of which

the best is deep sandy loam over clay and the worst a heavy clay loam which becomes compacted during harvest. Harvest begins 6 weeks after seed sowing and continues for about 3 months. The usual manurial treatment in South Australia is a broadcast dressing of 5-6 tons per acre of well-rotted stable manure, or 3 tons of mature fowl manure or a basal dressing of $\frac{1}{2}$ ton per acre of bone dust or blood and bone manure worked into the wide irrigation furrow on the side of which the seeds are sown. The seeds are sown 6 inches apart and 1 inch in depth along the high water mark of the irrigation furrows which are 6 feet apart; $1\frac{1}{2}$ -2 lb. of seed per acre are required. To ensure continuous and vigorous growth 1-2 cwt. per acre of sulphate of ammonia is broadcast in the drills when it becomes necessary; it must not touch the foliage or it will cause severe burning. In harvest picking must be done daily or a first-grade gherkin one day will be too big the next. Early pickings hardly pay but are necessary, otherwise the fruits left retard growth of the vine and hinder future settings. Careless handling of foliage may do much damage and the runners must not be trodden on during picking. Grading is done at the factory and growers' returns are based on the out-turn of various grades. No. 1 grade, $1\frac{1}{2}$ inches long by $\frac{1}{2}$ inch in diameter, is the most profitable. The grades lower with increase in size of gherkin. The average price paid in Adelaide factories in 1939-40 varied from Grade 1, 4d. lb., £37 6s. 8d. per ton, to Grade 4, in which fruits ranged from $3\frac{1}{2}$ inches to $3\frac{3}{4}$ inches in length and over $1\frac{1}{4}$ inches in diameter, 1d.-1 $\frac{1}{4}$ d. lb., £9 6s. 8d. per ton. The chief disease is powdery mildew. A strong precautionary dusting of sulphur particularly in the heart when the plants are 12 inches long will prevent an outbreak. The chief varieties are National, Heinz, True Pickling and Hackett's Gherkin.

116. BOHART, G. S. 635.64 + 664.84.64.036.5
Studies of western tomatoes.
Food Res., 1940, 5 : 469-86, bibl. 14.

Some 141 samples of tomato representing 12 varieties from different parts of California, Colorado and Utah were submitted to an analytical study. Many chemical constituents and physical characteristics were found to have a highly significant correlation. Thus positive correlation existed between pulp and calcium, total acidity and magnesium, protein and ash, seeds and H + concentration and some 10 other pairs of characters, and negative correlations between H + concentration and potassium, sugar and ash, sugar and total acidity, crude fibre and pigment.

117. GOODALL, D. W., AND BOLAS, B. D. 635.64 : 581.143.26.03
Vernalization of tomatoes.
Gdnrs' Chron., 1940, 108 : 261-2, reprinted from *Fruitgrower*, 1941, 91 : 27.

In these experiments at Cheshunt seeds of the virus-free Potentate tomato were chilled at temperatures of 0°, 2-5°, 7° and 9-5° C. for 10 days and 20 days. They were then placed in an incubator at 14° C. to germinate together with the controls. On germination on 30 December, 1938, they were put in seed boxes in the greenhouse. At the end of March 1939 they were planted in the greenhouse in randomized blocks—40 plants from each of the 8 treatments and 160 control plants. While the 4 different temperatures gave much the same results, the plants from seeds given 20 days' vernalization yielded a crop 11% greater than that of the controls, the difference being particularly marked in the first few weeks. This is the first time that methods of statistical analysis have been applied to vernalization experiments with tomatoes, and significant increases were shown. For growers who wish to make the experiment it is suggested that they should sow the seed some 3 or 4 weeks earlier than usual, water and put the seed boxes in chilling conditions until the normal date is reached for their being brought to a suitable temperature for germination. In southern England it is thought that the open-air temperature of December—given adequate protection against frost—would probably be adequate for chilling. If a refrigerator were available in which the temperature could be kept between 0° and 10° C. this would be excellent, or again a cold fruit store might be used, though here there is a possible risk of the emanations from the fruit affecting the seed. A fuller article on the experiments is promised.

118. MACK, W. B., STOUT, G. J., AND RAHN, E. M. 635.64 : 631.8
Fertilizer experiments with tomatoes.
Bull. Pa agric. Exp. Stat. 393, 1940, pp. 28.

This bulletin contains an account of the results of a long-time field plot experiment with tomatoes forming one item in a 4-year rotation. Previous reports were made in bulletins 210 and 227.

The crops in the rotation were cabbage, potatoes and tomatoes as truck crops, with autumn-sown wheat followed by timothy and clover the following summer from 1917 up till 1928. Thereafter the wheat and clover were replaced by sweet corn. A cover crop of rye and vetch was planted after the removal of the main crop each year except on certain plots receiving farmyard manure. Discussion of results is confined to differences found among the mean yields of plots receiving the various treatments. In the trials 30 different manurial treatments were applied to certain plots during 19 years. Manurial treatments associated with the greatest mean yields of all fruit and of marketable fruit are:—rotted farmyard manure; complete fertilizer containing nitrate of soda giving 30 lb. N to the acre; superphosphate giving 100 lb. P_2O_5 and muriate of potash giving 80 lb. K_2O to the acre, broadcast before planting, together with a side dressing of nitrate of soda (same amount as before) at the time of blossom set; complete fertilizer supplying 150 lb. P_2O_5 , 60 lb. N and 80 lb. K_2O ; complete fertilizer supplying 100 lb. P_2O_5 , 60 lb. N and 40 lb. K_2O ; complete fertilizer supplying 200 lb. P_2O_5 , 120 lb. N and 160 lb. K_2O + 10 tons rotted manure to the acre. Ammonium sulphate, tankage and dried blood were less favourable to yield than calcium nitrate and cyanamide. Marketable yields were very highly correlated with total yields. There was some evidence that dilute P_2O_5 or superphosphate solutions applied to the roots at transplanting increased the early yield of tomatoes in comparison with water alone applied similarly.

119. LEE, F. A., AND SAYRE, C. B. 635.64 : 581.192 : 631.432

Effect of soil moisture on acid content of tomatoes. A preliminary report.

Food Res., 1940, 5 : 69-72, bibl. 6.

Preliminary trials with 2 canning varieties of tomato, namely John Baer and Marglobe, 1 variety used chiefly for paste production, viz. King Humbert, and 1 variety, Golden Queen, which has yellow juice, showed that on the average the total acid content under drought conditions is higher than under wet conditions. They also showed that the total acid in ripe fruit at the beginning of the season is high, that it then drops to rise again in the ripe fruit at the end of the season whether grown under wet or dry conditions. It would appear useful to select tomatoes for growth which show minimum variation in acid content when grown under different moisture conditions.

120. SMITH, K. M. 635.64 : 632.8

The tomato and the cigarette.

J. roy. hort. Soc., 1941, 65 : 243-4.

The danger to glasshouse tomatoes of infection by the tobacco mosaic virus through contact with tobacco smokers working in the houses is discussed. Workers should not smoke in the houses and smokers should always wash their hands carefully before entering. This virus is very resistant and can withstand a temperature of 200° F. for 10 minutes. It is exceedingly infective and can be transferred from diseased to healthy plants by a touch of the hand. *Nicotiana glutinosa* reacts to infection by the formation of local lesions and the plant is useful for testing for the presence of virus. The leaves should be rubbed with juice extracted from suspected tobacco.

121. KELLEY, E., DIETRICH, K. S., AND PORTER, T. 635.65 : 577.16

Vitamin B₁ content of eight varieties of beans grown in two localities in Michigan.

Food Res., 1940, 5 : 253-62, bibl. 6.

Figures based on biologic tests with rats show that the vitamin B₁ values of 8 bean varieties grown in Michigan ranged from about 3 to 1 international units per gram. Blue Pod and Robust were highest, Cranberry and Yellow Eye lowest, while Great Northern, 1,200-1, Kidney and Michelite were intermediate.

122. ARNOLD, H. C. 635.65

New strains of velvet beans.

Reprinted from *Rhod. agric. J.* as *Bull. Minist. Agric. S. Rhod.* 1164, 1940, pp. 5.

An account of 2 crosses between the Somerset velvet bean and *Stizolobium aterrimum*, namely Marbilee and Jubilack. Marbilee produces heavier crops of fodder suitable for use as hay or

silage than Somerset and almost as much seed, if sown early. Jubilack gives considerably more fodder than Somerset, but also much less seed (i.e. 71% and 25% less in two successive years). It is not suitable for districts liable to early frosts.

123. MURPHY, D. M. 635.65 : 632.8
A Great Northern bean resistant to curly-top and common bean-mosaic viruses.

Phytopathology, 1940, **30** : 779-84, bibl. 7, being *Res. Pap. Idaho agric. Exp. Stat.* 185.

A hybrid selection of the "haricot" bean, Great Northern, resistant to bean mosaic and curly top has been introduced by the Idaho Agricultural Experiment Station under the name Great Northern U.I. 15.

124. GOTTWICK, R., AND ALTEN, F. 635.655 : 631.8
 Untersuchungen über den Einfluss der Düngung auf das Wachstum und die Entwicklung der Sojabohne. (**The effect of manuring on growth and development of soya bean.**)

Ernähr. Pfl., 1939, **35** : 277-84.

Plots of soya beans were given the following treatment :—(1) No manure. (2) Nitrogen + phosphoric acid without potash. (3) Nitrogen + phosphoric acid + potash as kainit. (4) Nitrogen + phosphoric acid + potash as potassium magnesia. (5) Nitrogen + phosphoric acid + potash as 40% potassium salts. Manuring per ha. was :—20 kg. N as Leunasalpeter. 50 kg. P_2O_5 as superphosphate ; 120 kg. K as kainit, as potassium magnesia, or as 40% potassium salts. The results are not considered satisfactory if yield alone is in question. Taking yield of seed and yield of straw separately, however, the effect of potassium on increasing seed yield is shown. A determination of the crude protein, fat and lecithin in the soya bean under different types of manuring, showed a decrease in the crude protein content in the nitrogen-phosphoric acid-potassium plots as compared with the nitrogen-phosphoric acid and unmanured plots. The values for fat and lecithin, however, increased in the seeds from the fully manured plots. The lecithin content was highest from the potassium magnesium-fully manured plots. Manuring appeared to make very little difference in the amount of P_2O_5 and K_2O in the beans and in the straw. The nitrogen requirements are mainly covered by the bacteria of the root nodules. In a light sandy soil, a nitrogenous manure of 20 kg./ha. is advantageous for the development of the young plants. It is possible to double the yield, under favourable conditions of growth and cultivation, and to this end a manuring of 40-60 kg. P_2O_5 and 120 kg. K_2O per ha. is recommended.

R.M.I.

125. GIESECKE, F., AND YI-LUNG LIU. 635.655 : 631.83
 Steigende Kaliumsulfatgaben in ihrem Einfluss auf Ertrag und Zusammensetzung der Sojabohne. (**The effect of increased applications of sulphate of potash on yield and composition of soya bean.**)

Ernähr. Pfl., 1940, **36** : 73-7.

Plants of the Giessener Schwaze variety were grown in Mitscherlich vessels. The three controls were supplied with 6.5 kg. of sandy Dahlem subsoil, which is as a rule poor in potash but rich in phosphoric acid and neutral in reaction. The seeds were inoculated with bacteria before planting. Each vessel was given 0.25 g. of N in the form of NH_4NO_3 . The basal manuring consisted of 1 g. P_2O_5 as $CaHPO_4 \cdot 2H_2O$, 1 g. Mg. as $MgSO_4 \cdot 7H_2O$, 0.1 g. Na as NaCl and some manganese as manganese sulphate. The potash was given in the form of chemically pure K_2SO_4 as follows :—0.0, 0.5, 1.0, 1.5, 2.0, 2.5 g. The results showed that increasing amounts of K_2SO_4 increased the seed yield but somewhat decreased the yield of straw. The percentage content of the soya bean and the amount of oil were increased and at the same time there was an equally slight decrease in the percentage protein content, while the protein content remained the same. The vegetative period was shortened. Under the conditions of the experiment, the potash content was increased. The potash appeared to narrow the ratio of crude protein to pure protein. The ratio of P_2O_5 to K_2O most suitable for increase in production and quality of oil and protein lies between 1 : 1.5 and 1 : 2.

R.M.I.

126. ANON. 635.8

Edible and poisonous fungi.

Bull. Minist. Agric. Lond. 23 (5th edit.), 1940, pp. 26, 2s. 6d.

A brief illustrated account in non-technical language [there is a glossary of the few technical terms used] is given of the prominent and distinguishing characters of 17 edible fungi and 9 poisonous fungi commonly found in U.K. The illustrations are attractive and clear. This small practical guide is well worth the price asked.

127. STEENKAMP, J. L. 633.71-1.4

Survey of the most important tobacco soils of the Union of South Africa.

Bull. Dep. Agric. S. Afr. (Division of Chemical Services) 213 (Chemistry Series 160), 1940, pp. 74.

A detailed account of the soil features of the different tobacco areas in the Union and their influence on the production of tobacco and on the type of tobacco produced.

128. VALLEAU, W. D. 633.71-2.8

Classification and nomenclature of tobacco viruses.

Phytopathology, 1940, 30 : 820-9, bibl. 8.

Eight viruses causing disease in commercial plantings of tobacco are described and a simple key is provided. Viruses that show no relationship to others are given generic rank. The use of serology and protection as a means of classifying viruses are discussed.

129. WALLACE, J. M. 633.71-2.8

Evidence of passive immunization of tobacco, *Nicotiana Tabacum*, from the virus of curly top.

Phytopathology, 1940, 30 : 673-9, bibl. 8.

Evidence is offered that Turkish tobacco plants infected with curly-top virus can develop protective substances whereby they recover and tolerate the virus remaining in them and cannot be reinfected though remaining infective. This protective substance can be transferred to other plants and hastens their recovery. The production of mild symptoms on healthy plants grafted with plants having acquired this immunity is believed to be an example of a kind of passive immunization, a phenomenon not previously reported in plants.

130. PINCKARD, J. A., AND OTHERS. 633.71-2.4

Toxicity of paradichlorobenzene in relation to control of tobacco downy mildew.

Phytopathology, 1940, 30 : 485-95.

McLEAN, R., AND OTHERS.

The use of paradichlorobenzene in seedbeds to control tobacco downy mildew.

Ibidem, 30 : 495-506, bibl. 4.

The minimal concentration of paradichlorobenzene vapour fungicidal to tobacco downy mildew (*Peronospora tabacina*) is within the range 0.01 and 0.02 volume percentage, equivalent to saturation pressures within the temperature range 0° C. to 7° C. Three to four consecutive treatments within this range are necessary. The maximal concentration of PDB vapour tolerated by the seedling for a single 12-hour fumigation is approximately 0.0375 volume percentage, equivalent to saturation at 12° C. The limitation of PDB within the temperature range 0° C.-7° C. might render it ineffectual in seed beds within this temperature range because leakage might render these saturation pressures difficult to maintain. This can be circumvented in the field by methods described in the second paper. The crystals, 1.5-3 lb. per application per seed bed area of 100 sq. yd., are distributed widely on the top of a loose-textured cloth as ordinarily used for seed bed covers. Heavy covers of sheeting approximately 60 threads each way per inch are drawn over the distributed crystals. Temperatures above 7° C. are needed to ensure vaporization sufficient to maintain effective vapour concentrations. Under seed bed conditions moisture on the covers assists in retaining effective concentrations of vapour within the seed bed.

131. BONDE, R., STEVENSON, F. J., CLARK, C. F. 633.491-2.411

Resistance of certain potato varieties and seedling progenies to late blight in the tubers.

Phytopathology, 1940, 30 : 733-48, bibl. 6.

- KUGLER, W. F., AND REMUSSI, C. 633.52-2.4 + 2.111
 Algunas características morfológicas, fitopatológicas y de resistencia a las heladas. . . . (Morphological and phytopathological characters in flax in relation to frost resistance.) [Summaries in English and German 1 p. each.] Reprinted in 1939 from *Granos*, 3 : 3 : 3-24, 3 : 4 : 3-38, bibl. 29.
- RUST, A. B. 635.64 : 631.57
Preparation and marketing of tomatoes.
Fmg S. Afr., 1940, 15 : 398-9.
- HATCHER, E. S. J. 635.64 : 631.523
Studies in the inheritance of physiological characters. V. Hybrid vigour in the tomato. Part iii. A critical examination of the relation of embryo development to the manifestation of hybrid vigour.
 Reprinted from *Ann. Bot. Lond.*, 1940, 4 : 735-64, bibl. 30.
- HEMMI, T., AND KONISHI, S. 635.646 : 632.411
Studies on the *Phytophthora* rot of egg plant on the market. [Japanese, English summary 1 p.]
Ann. phytopath. Soc. Japan, 1939, 9 : 157-69, bibl. 22.
- ZIMMERMAN, W. I., TRESSLER, D. K., AND MAYNARD, L. A. 577.16 : 635.65 + 635.67
Determination of carotene in fresh and frozen vegetables. 1. Carotene content of green snap beans and sweet corn.
Food Res., 1940, 5 : 93-101, bibl. 14.
- BURRELL, R. C., AND WOLFE, A. C. 635.655 : 581.192
A comparative study of the chemical composition of five varieties of soybeans.
Food Res., 1940, 5 : 109-13, bibl. 9.
- ARNOLD, H. C. 635.655
Soya beans. Notes on cultivation [in Rhodesia].
 Reprinted from *Rhod. agric. J.* as *Bull. Minist. Agric. S. Rhod.* 1165, 1940, pp. 20.
- SHERMAN, W. C. 635.655 : 577.16
Chromatographic identification and biological evaluation of carotene from mature soybeans.
Food Res., 1940, 5 : 13-22, bibl. 12.

FLOWER GROWING.

132. YERKES, G. E., AND OTHERS. 635.979.872
Gardenia culture.
Leaflet. U.S. Dep. Agric. 199, 1940, pp. 8.
 Notes on cultivation of the gardenia out of doors and under glass, with hints on the control of chlorosis, bud drop, stem canker (*Phomopsis Gardeniae*), various leaf troubles, nematodes, white fly, mealy bug scales, Fuller's rose beetle and leaf roller.
133. BEATTIE, W. R. 635.62
Useful and ornamental gourds.
Fmrs' Bull. U.S. Dep. Agric. 1849, 1940, pp. 13.
 Ornamental and useful gourds belong mainly to two groups. The first, *Cucurbita Pepo* var. *ovifera*, has coarse foliage and yellow, more or less scentless, flowers which bloom in the daytime, and smallish inedible fruits. It is grown mainly in the Northern States. The second group includes *Lagenaria siceraria* (formerly *L. vulgaris*). The fruits are larger. They have soft, delicate foliage and sweet scented, white flowers which open at night. Many have odd shapes and the variation in size is immense. Loofah sponges are derived from another interesting group belonging to the genus *Luffa*. The dipper and calabash (pipe) gourds belong to the *Lagenaria* genus. The Italian edible gourd is *Lagenaria leucantha* var. *longissima*. The flesh of this is thick and tender and it is used in the same way as summer squash. Notes are given of many others of interest for their possible use as ornaments or bird boxes. They are fairly easy to cultivate, soils suitable for cucumbers and squashes also suiting gourds. They are

tender annuals. They do well in a climate where day temperature in midsummer is 70-85° F. and the night temperature only a few degrees lower. A growing season of 140 days is necessary. Hints are given on the control of diseases and of two pests, the striped cucumber beetle and melon aphid, and directions are added for shaping (in growth), gathering, curing and preparing gourds.

134. GROVE, L. C. 635.944

Gladiolus culture in Iowa.

Bull. Iowa agric. Exp. Stat. Ext. Serv. Bull. P12, 1940, pp. 339-59.

Cultivation, including hints on treatment of scab, rots, thrips and other insects.

135. STOUGHTON, R. H. 635.944 : 631.8

The nutrition of Dutch Iris : an experiment in factorial design.

J. Pomol., 1941, 18 : 297-306, bibl. 3.

The design of a simple factorial experiment and the method of computation of the results is described. Factorial design in plant nutrition experiments is the inclusion of all possible combinations of treatment so as to increase the number of comparisons for each element and thus to raise the precision of the whole experiment. As a result of experiments on these lines in the nutrition of Dutch Iris in sand culture, nitrogen is shown to play the dominant rôle in the growth of aerial parts and phosphorus in the development of the bulb.

136. HARGRAVE, J., THOMPSON, F. C., AND WOOD, J. 635.944

Size as a factor in the chemical composition and morphological structure of tulip bulbs.

J. Pomol., 1941, 18 : 307-24, bibl. 23.

An investigation of the dry matter, mineral and nitrogen content of Wm. Copland tulip bulbs is described. The significance of differences found to occur between sizes for all constituents examined is discussed in relation to size and morphological development. The experimental results are also considered in the light of certain aspects of recent plant physiological research. The results of a preliminary investigation of the carbohydrate composition of tulip bulbs are included. The importance placed on size in commercial practice seems to be justified and size would appear to be related to actual differences in chemical composition and morphological structure. An experiment in commercial storage showed that while there was marked loss of weight in ordinary storage, it was unlikely to influence any variations in mineral composition that occur between the sizes in the variety Wm. Copland.

137. GREGORY, P. H. 635.944 : 632.4

The control of narcissus leaf diseases II.* The effect of white mould on flower and bulb crop.

Ann. appl. Biol., 1940, 27 : 472-88, bibl. 3.

Successful measures against white mould of narcissus are the clearing of old leaves from the beds and spraying with bordeaux mixture 4 : 4 : 40. Spraying effect was cumulative from year to year and sprayed plots produced better quality flowers and after 3 years an 80% heavier bulb crop, the increase being in weight rather than number. The value of increased crop obtained by spraying was diminished by the retardation of 6-8 days caused by spraying the previous season. The work was done at the Scilly Isles Experiment Station.

138. RATSEK, J. C. 635.937.34

Rose growing for the home gardener.

Circ. Tex. agric. Exp. Stat. 90, 1940, pp. 27.

CITRUS AND SUB-TROPICALS.

139. WEBBER, H. J. 634.3

Quarter century changes in cultural practices.

Calif. Citrogr., 1940, 25 : 382-3, 402-5.

The late director of the Riverside Citrus Experiment Station, California, gives a popular account of the changes and discoveries in citrus cultivation since the foundation of the station in 1913.

* Part I, *Ibidem*, 27 : 338-47 ; *H.A.*, 10 : (1405).

The subjects reviewed are orchard heating, manuring, soil deficiencies and toxicities, irrigation, tillage, bud selection, pest and disease control.

140. FROST, H. B. 634.3
The Pearl tangelo—a new citrus variety.
Calif. Citogr., 1940, 25 : 346.

A description of a new tangelo named the Pearl, produced by the cross, Imperial grapefruit × Willow mandarin at Riverside Citrus Experiment Station, California. Only a few trees exist, but budwood is now ready for distribution.

141. BLACKIE, W. J., AND JOHNS, R. 634.3
Observations on citrus introductions at Nasinu.
Fiji agric. J., 1940, 11 : 70-80.

A survey is made of the work done and methods adopted in connection with citrus at the Nasinu Experiment Station, Fiji. Certain recommendations are made. Spacing of trees should be not less than 24 ft. × 24 ft. Rootstock trials should be extended and carried out on land suitable for development under citrus. Sweet orange stock is susceptible to collar rot and should not be used, while certain orange varieties show some incompatibility to sour orange stock. Pending further study oranges for planting should be propagated on sour orange, rough lemon and trifoliate stock. Fruit can be produced in the wet zone equal to that of any citrus producing country. Varieties to be retained are Nasinu, Paramatta, Valencia Late, Washington Navel and Mediterranean Sweet, on a series of known stocks. Jaffa and Parson Brown should be discarded. The controls, a random sample of Fiji orange, have produced results that suggest that investigation may result in the isolation of types superior to those now under study. Duncan and Marsh grapefruits in Fiji are of good quality and their propagation on sour orange stock should be continued.

142. LAL SINGH, BAL SINGH BAJWA, KHAN, A. A., AND AMOLAK RAM. 634.3
Citrus fruits.
Punjab Fruit J., annu. No. for 1940, 4 : 648-61.

This paper represents a summary of the present position of citrus cultivation in the Punjab and of the recent work done to improve this crop. *Varietal trials.* *Malta Orange.* About 30 varieties are under trial and a number have been found worthy of propagation. Within the last few years the price of Malta fruit has fallen sufficiently to place them within reach of a very much larger public than formerly. Quality tests show that the variety Pineapple has the least amount of peel and the highest content of juice and total soluble solids. Notes are given on the quality of a number of others. Maturity tests on Malta have provided useful information as to time of ripening of the different varieties which spreads over 2½ months. *Sangtra orange.* 32 varieties are under trial. The Sangtra grows best in the submontane tracts and high quality appears to be due to favourable climatic conditions rather than to the inherent character of any variety. *Grapefruit.* 14 varieties are under trial. Ten years ago there were only a few trees in the Province. Now there are over 10,000. *Lemons and limes.* 14 varieties are under trial of which so far 5 or 6 have proved worth propagating. *Bud selection.* A bud selection society has been formed to select trees throughout the Province worthy of propagation for distribution. *Budding experiments.* The chief result obtained was the consistently higher percentage of success (25%) obtained when a thin strip of wood was left behind the bud shield, especially with somewhat immature budwood. This is called here the "American method". A 25% saving of time was also effected. The sour lime, Kaghzi Nimboo, usually grown from seed and therefore very variable has budded well on "khatti" provided the so-called American method is used. In *manurial trials*, the first of any importance to be done on citrus in India, the best results were obtained when artificial nitrogenous fertilizers were applied in conjunction with farmyard manure. The root pruning which is a feature of Bombay citriculture is not suitable to the Punjab. The yield of certain vigorous but persistently unfruitful trees was, however, increased as a result of some experiments which are described. In *ringing* experiments the ringed trees and limbs always gave a higher yield and larger fruits than the unringed. *Electric stimulation.* Experiments on shy bearing trees are

in progress whereby the tree is treated with electric energy derived from an ordinary battery. The current is passed through a small induction coil so that a $\frac{1}{4}$ inch spark between the 2 terminals is obtained. The spark passes between the wire netting attached to the plant in the form of a collar. Yield records will be available in due course. *Packing.* Plants lifted, the roots washed clean of soil, then dipped in liquid mud and packed in a box with the interspaces in the root systems filled with soil, travelled equally well and practically without loss and were equally as flourishing two months after replanting as plants boxed in the prevailing manner with heavy balls of soil attached wrapped in gunny and tied with twine. Freights were halved and labour and cost of material much reduced. When the interspaces in the mud dipping method were packed with moist sawdust instead of earth there were heavy losses. Lifted plants slightly headed back produced better growth on replanting than trees severely cut back or trees defoliated but not pruned.

143. RICHARDS, A. V. 634.3-1.541.11

Influence of rootstock on quality of citrus fruit.

Trop. Agriculturist, 1940, 94 : 354-61, bibl. 9.

Investigations made during an entire season in California indicate a definite rootstock influence on size, colour, texture, juice content and percentage of soluble solids and citric acid in Washington Navel and Valencia orange, Satsuma and Dancy tangerine, Marsh grapefruit and rough lemon budded on trifoliolate orange (*Poncirus trifoliata*), grapefruit, sour orange, sweet orange and rough lemon. On trifoliolate, the most dwarfing stock, all the varieties gave the highest values for percentage of citric acid and with one minor exception for percentage of soluble solids; on rough lemon, the most invigorating stock, the lowest values for both citric acid and soluble solids were obtained. On both stocks the solids/acid ratio is relatively high early in the season. The invigorating stocks appear to hasten granulation or drying out of juice vesicles. Own rooted trees of all varieties except Satsuma and a rough lemon seedling tree of nucellar origin are included in the studies. [From author's summary.]

144. LAL SINGH, AND SHAM SINGH. 634.3-1.541.11 + 634.8

Citrus rootstock investigations and grape vine hybridization.

Punjab Fruit J., annu. No. for 1940, 4 : 662-6.

Citrus rootstock trials were initiated at Montgomery in the Punjab in 1937 with the following stocks : kharna khatta, jatti khatti (rough lemon), mitha (sweet lime), mokari (citron), chakodra (pomelo), jullunduri khatti (smooth lemon), nasnaran (a rootstock variety from Ceylon). While the interesting results obtained cannot yet be fully accepted it seems that a variety of kharna khatta has an invigorating effect on malta, sangtra and grapefruit while a variety of mitha is the most dwarfing. Attempts are being made to straighten out the citrus nomenclature of India which is in such a confused state as even to lead to quite erroneous conclusions in experiment. An example of this which might have caused great harm to the citrus industry is given. In comparing methods of rootstock propagation plants raised from cuttings were more precocious and prolific than plants of similar varieties raised from seed. Effects of these differences on the scion is not yet established. The proposed work on the hybridization of grape vines, just started with the financial assistance of the Imperial Council of Agricultural Research, India, is outlined.

145. BANGE, J. A. 634.3-1.541.5

Het oculereen van citrus in Suriname en de toepassing van de daar gebruikelijke methode in Nederlandsch Indië. (The budding of citrus in Surinam and the application of the method in the Dutch East Indies.)

Landbouw, 1940, 16 : 372-7.

The method of budding citrus in Surinam, which is that used in California and the British West Indies, differs from the practice in the Dutch East Indies. Sour orange stock is used, being easily obtainable, robust, disease resistant and compatible to many scion varieties. For stock raising fresh seed should be used as it quickly loses its viability. Three months after sowing the seedling stocks are set out in beds of deep soil well supplied with farmyard manure. Each bed holds only one of the three sizes into which the stocks are graded. They are ready for budding 6 months later. The T shield method is used, the buds being inserted on the windward side at a height of 45 cm. The tie is made with strips of cotton dipped in paraffin wax. After

9 days the upper part of the tie is unfastened, the loosened end being allowed to hang down. The actual cut however is left covered. If this loosening is delayed even a couple of days many losses will occur. As soon as the bud begins to swell the stock is bent over above and as near to the union as possible and tied to the stock foot. This operation is performed about 12 days after the first loosening of the bud tie. Shoots arising on the stock are removed at once. The growth of the scion bud on these bent over stocks is very much stronger than if the stock had been topped as in Java. The striking difference is illustrated by photography. These differences were shown also with rough lemon and *Citrus nobilis* stocks in experiments conducted by the author on his return to Java. A year from the time of sowing the stock the budded plants are lifted with a ball of soil and transferred to plant baskets. The object of the paper is to call attention to the superior growth, reduced disease susceptibility in the nursery, the great gain of time in producing saleable plants and the consequent reduction in cost brought about by these factors which are characteristic of the bent over method as compared with the topping method.

146. STEINSCHNEIDER, K. 634.3-1.67 : 581.144.2
Rooting of citrus and irrigation.
Hadar, 1940, 13 : 227-9.

This article reviews 2 papers by S. R. Gandhi* with special reference to the sections on irrigation of citrus and discusses the application of some of the precepts therein to Palestine conditions. The author is not convinced that Gandhi's contention that citrus orchards in which the roots or branches of the adjoining trees meet are on the decline as regards cropping. This is the normal condition of many Palestine groves and the Shamouti (i.e. Jaffa) orange certainly benefits in quality of fruit from the shading and protection from drying winds resulting from close planting. Reasons for close planting in Palestine are, a desire to use the ground as fully as possible and a lack of knowledge of intercrops which might provide compensation in cash until the wider planted trees are large enough to fill the spacings. No criticism is made of the statement that cover crops consume or intercept the moisture which would otherwise be used by the citrus roots in cases of light rainfall, but it is pointed out that rainy season cover crops (as opposed to permanent crops) have proved beneficial in Australia and California. Gandhi sees no harm in damaging the feeding roots, which are mostly just under the soil surface, by cultivation since these are only transitory and are constantly renewed. Six principles of irrigation and the methods employed for conveying the water are discussed.

147. CHAPMAN, H. D., AND LIEBIG, G. F. 634.31-1.8
Nitrate concentration and ion balance in relation to citrus nutrition.
Hilgardia, 1940, 13 : 141-73, bibl. 27.

Trials with sweet orange seedlings in sand cultures show that low concentrations of nitrate nitrogen (6-7 p.p.m.), if maintained, suffice for a rapid rate of vegetative development in citrus under rather widely varying conditions of chloride, sulphate and cation concentration. Results also indicate that a balance in the nutrient solution between Ca and K favourable for K absorption favourably influences nitrate absorption. Increased chloride and sulphate concentrations did not depress nitrate absorption or utilization. The permanent maintenance of a nitrate nitrogen level at at least 6-7 p.p.m. is, however, in the orchard probably impracticable, and unless there were close synchronization between absorptive and renewal rates, the above low concentration of 6-7 p.p.m. found to be adequate in sand culture would not suffice in the orchard. The nearest practical approach for the grower would be to apply nitrogen in frequent small doses. It is thought that, despite the additional labour necessary, the reduction in leaching and volatilization losses might well more than cover this item.

148. HINCKLEY, F. 634.3
Hinckley system of culture.
Calif. Citroy., 1940, 25 : 300.

A successful grower of oranges describes his method of cultivation which can be operated on all but very sandy soils. The only tools used are hoe, rake and shovel, and costs of cultural practice

* A study of the methods of cultivation of fruit trees with special reference to citrus. *Trop. Agriculturist*, 1939, 92 : 3-15; *H.A.*, 9 : 561 and *Ibidem*, 93 : 68-75; *H.A.*, 10 : 203.

have been reduced by half. Four irrigation furrows are used and have been unchanged for 8 years; the tree furrows are placed one-half the distance from the outer drip to the trunk of the tree, the middle furrow being 3 to 3½ feet from the tree furrow. These supply one-half the root system and checks between the trees, made with a hoe, supply the other half. There is no plough sole and the water goes straight to the roots. Water is not spared and the trees are not allowed to reach wilting point. Weeds are kept down by hand hoeing before they reach the seeding stage. The fallen leaves are left lying and are the only source of organic manure. Commercial fertilizer is applied during the winter rains, which convey it into the soil. The leaves and chickweed reduce soil erosion. Removal of dead wood is the only pruning given and the brush is piled between the trees and rots down in a few years. Suckers are not removed because the owner believes that for every branch produced a new root is formed, the sucker eventually dies and the root remains to function. In initiating this form of cultivation (or non-cultivation as it is called) on young orchards the weeds except those immediately near the tree can be disc-harrowed, but as the trees grow the hand hoeing can be expanded to cover the whole area and with little work. It is claimed that this method has doubled production.

149. FAIRCHILD, R. E.

634.31-1.8

Are fertilizer practices cause of small sized fruit ?

Calif. Citogr., 1940, 25 : 280.

The small size and poor flavour of oranges in many Californian orchards is traced to the fact that for many years the trees had been manured with nitrogen and little else, this practice being a reaction from the time when the usual manure had a very high phosphoric acid content. As a result much of this phosphoric acid was not used by the tree and reverted to temporary insolubility, and the natural phosphates in the soil are now nearly used up and are not being replaced as the nitrogen is. Examples are cited of these declining trees being completely rejuvenated in one season by the application of highly available phosphate, the nitrogen ration per tree remaining unaltered. The character of the fruit was quite changed, being now highly flavoured and solid with no tendency to puffiness in April.

150. BENTON, R. J.

634.3-1.542

Declining citrus trees : rejuvenation by pruning.

Agric. Gaz. N.S.W., 1940, 51 : 450-1.

Citrus trees in a declining condition may often be renovated by severe pruning if the decline has not gone too far. The operations involved are :—Manuring the trees early in late winter ; cutting back severely in early spring ; whitewashing the trunk and remaining main arms. A good whitewash is made as follows :—Slowly add hot water to 14 lb. of lump lime ; while fiercely boiling add 1 lb. tallow or fat and continue slowly adding until lime is thoroughly slaked and the mixture the consistency of very thin cream. Grafting wax or a proprietary bituminous mastic should be used to seal cut surfaces. In climatically humid areas, i.e. where the environment is likely to suit fungus spore germination, the wounds should be sterilized with stockholm tar or bordeaux paste a few days before sealing. The dense growth which may result should remain unthinned for a year or two and after that be gradually reduced.

151. KEPNER, R. A.

634.3-2.111

Automatic regulators on orchard heaters.

Calif. Citogr., 1940, 25 : 366-7.

A superior automatic regulator for oil heaters is described. It is approved by the Riverside Citrus Experiment Station, California, as being a labour-saving and otherwise desirable device. The need for a " follow-up man " is obviated, resulting in a $\frac{1}{3}$ or $\frac{1}{2}$ reduction in labour costs. The regulator differs from those in common use by a reduction of air leakages round the edge of the regulator plate and smaller draught holes permitting more accurate adjustment and therefore more uniform burning rates. The cap over the regulator parts fits tightly so that round bowl lazy flame heaters with good covers may be extinguished without closing the stack caps and so without risk of the explosion or blowing up of heaters, a frequent occurrence with distilling type heaters in the field. Smoke output is greatly reduced.

152. ANON. 634.3-2.111

Orchard heating demonstrations.

Calif. Citrogr., 1940, 26 : 11, 28.

Orchard heating devices were demonstrated to growers in Southern California by the University of California. The return gas stack heater is the most important recent development. It burns all types of oil and gives little trouble. Its size and cost are possible objections. A solid fuel heater was shown which holds 40-60 lb. coke and burns 7 lb. per hour. To avoid wastage of coke during short night frosts small wire baskets containing 13 lb. of coke were devised. Coke gives more radiant energy than oil which is of benefit on nights when there is no ceiling. A number of small heaters on these occasions is better than a few large ones. Coke can be quickly ignited by pouring heater oil over it. Kindling wood is not then required. Portable measuring apparatus for recording temperature above the tree tops was shown. The basic requirements of a heater are that it shall be of sufficient fuel capacity, be capable of regulation to increase heat even when fuel is low, be rainproof, be able to deliver heat near the ground, be easy to light in all weathers by inexperienced staff, show uniform burning without constant regulation, be readily extinguished, burn several nights without cleaning, be easily filled and of reasonable cost.

153. LEONARD, A. S., AND BROOKS, F. A. 634.3-2.111

New type of orchard heater.

Calif. Citrogr., 1940, 26 : 14-5, 20, bibl. 1.

The development and operation of the return stack orchard heater is described and illustrated. The heater was originally developed at the California Agricultural Experiment Station, Davis, by the senior author. The object of the heater is to minimize the smoke nuisance from oil heaters in the field. The advantages claimed are :—ease of lighting and extinguishing ; consumption of ordinary orchard heater oils ; little smoke over relatively wide burning rates (0.5 to 0.9 gall. p.h.) ; little soot accumulation in stack ; fairly good radiant energy characteristics ; will burn dry without smoke or injury to bowl ; reduces pour-back problems if covers are regularly cleaned. The underside of the cover, however, requires cleaning after every 20-30 hours of burning.

154. WAGER, V. A. 634.31-2.4

The November-drop and navel-end-rot problems of navel oranges in the Kat River Valley.

Citrus Gr., 1940, No. 81, pp. 5-6.

A summary of Science Bulletins 192 and 193, Union of S. Africa Department of Agriculture. The heavy fruit drop which usually occurs in November with citrus in Cape Province was at first thought to be due to the fungus *Alternaria Citri* which was very frequently present on dropped fruit. The fungus, however, was found in similar proportion on young green fruit and the drop occurred even when the trees had been frequently sprayed and given extra heavy applications of nitrogenous manures. It is now thought probable that the drop is caused by the heat, hot winds, and drought occurring at this time, especially as when the weather is unseasonably cool and damp the drop is delayed until hot weather supervenes. Navel-end-rot is caused by *Alternaria Citri*. This and the phenomenon known as splitting, in which the fruit splits open at the navel end and rots when it begins to size up, predominates in oranges with large navel ends. The misshapen navels are attributed to hot dry weather causing the style to shrivel and become brown and hard and to remain attached instead of breaking off cleanly. In such cases a misshapen navel is caused. Splitting occurs when the fruits which have closed navel ends are $1\frac{1}{2}$ -3 inches in size. Small cracks appear at the navel and these increase in size and produce star-shaped cavities which subsequently may develop into large irregular navel ends. Unlike the navel-end-rot this only occurs on the top and outside fruit and is due to abnormal water relations arising from a slight wilting of the trees on hot days prior to irrigation. It is more common after a hot dry summer than after a cool wet one. Control of these troubles is difficult. The advisability of shelter from hot winds and of ensuring that the trees have enough water when the fruit is 1-2 inches in size is stressed.

155. FAWCETT, H. S., AND KLOTZ, L. J.

634.3-2.4

Septoria spot of citrus fruits.*Calif. Citrogr.*, 1940, 26 : 2.

Septoria Citri or *S. Limonum* causes external spot of orange in parts of California. Infection is increased when the spores are spread by rain or atmospheric humidity or even by overhead irrigation. Treatment is to spray with 1 : $\frac{3}{4}$: 100 bordeaux mixture in autumn before the first rains. At the same time this spray will also deal effectively with brown rot. Zinc treatment for mottle leaf may be included in the spray. The zinc appears to assist in preventing the germination of *Septoria* spores.

156. DYAL SINGH.

634.3-2.4

Withertip of citrus plants.*Punjab Fruit J.*, annu. No. for 1940, 4 : 722-3.

Withertip of citrus due to the fungus, *Colletotrichum gloeosporioides* Penzig, can be controlled in the Punjab by spraying in February, April and September with copper sulphate 4 lb., ferrous sulphate 4 lb., lime 8 lb., water 50 galls.

157. MILANEZ, F. R.

634.31 : 581.144.2 : 632.8

Observações sobre uma estranha doença das laranjeiras. (A strange disease of oranges.)*Rodriguésia*, 1940, 4 : 199-263, bibl. 35.

A disease of orange roots is very thoroughly examined, in which are concerned the mealy bug *Pseudococcus comstocki*, the fungus *Boletus tropicus* and an endotrophic mycorrhiza.

158. GONÇALVES, C. R.

632.752 : 634.3

Observações sobre *Pseudococcus comstocki* (Kuw., 1902) atacando citrus na Baixada Fluminense. (***Pseudococcus comstocki* attacking citrus in Rio de Janeiro.**) [English summary.]

Rodriguésia, 1940, 4 : 179-98, bibl. 19.

The mealy bug *Pseudococcus comstocki*, a common pest of citrus, besides attacking leaves and branches, settles in colonies on the roots where it is associated with the mycelia of a fungus thought to be *Boletus tropicus* Rick. The mealy bugs live underneath the mycelia. They reach the roots in the first place largely through the agency of a fire ant, *Solenopsis saevissima* var. *moelleri* Forel. None of the local rootstocks is resistant but the ant does not work in clay soils and trees on such soils are fairly immune. The same ant fosters the mealy bug among the foliage where the latter lives in extensive colonies in the shelter of curled or folded leaves. Both the mealy bug and the ant are mainly in evidence during the dry, cool months from May to December. The ant itself, apart from its interest in the *Pseudococcus*, damages young foliage, bark and fruit. There are numerous local parasites on the mealy bug, the most effective being two species of ladybirds (*Scymnus*) which, however, can only act effectively after the ant has made its seasonal withdrawal. The subterranean attack can be controlled by the application to the soil surface of an 0.3% sodium cyanide solution or of 0.25 or 0.5% carbon disulphide emulsion at the rate of 10 litres per square metre. Since the mealy bug is more or less dependent on the ant for its continued existence preventive control should be directed against the latter. The nests can be effectively destroyed by a direct stream of .5% creolin emulsion in August or September or by watering the nest with .05% solution of potassium cyanide.

159. BOYCE, A. M., AND OTHERS.

634.3-2.752

Black scale control : summary of studies with low dosages of oil with rotenone-bearing materials.*Calif. Citrogr.*, 1940, 25 : 314, 342-4.

Typical data are presented on the effectiveness of low dosages of petroleum oil with rotenone-bearing materials in the control of black scale of citrus (*Saissetia oleae*) in California. Greater effectiveness from the toxic principles of rotenone-bearing roots is obtained when these toxic principles are extracted from the root and solubilized with oil than when the powdered root containing the toxic principles as they occur naturally is used. Such low dosages in combination with rotenone-bearing materials are more effective on large black scale than the full dosage of

oil (1½%) alone. There are, however, important limitations to the use of such materials and they should not be used when the black scale infestation is heavy or where there is much smut on the foliage. The reduction of oil appears to reduce the incidence of navel water spot.

160. SMITH, H. S.

634.3-2.752

Biological control of scale pests.

Calif. Citrogr., 1941, 26 : 58, 76-7.

A brief popular account of the measures taken and progress achieved in the biological control of yellow, red and black scales of citrus in California. *Yellow scale*. The parasite is *Comperiella bifasciata*. Its action is erratic, giving good control in some places but unlikely to be generally effective for a long time. *Red scale*. *Habrolepis rouxi* was introduced from South Africa as a parasite in about 1936. It is easily reared in captivity but does not succeed in maintaining itself in the field. Apparently it finds the scale a congenial host but the citrus trees an uncongenial habitat. *Comperiella* is another possible parasite. Complications arising from the fact that red scale raised on sago palm is immune from parasitism by *Comperiella* delayed this work and have only recently been disentangled. *Black scale*. Four parasites, *Metaphycus helvolus*, *M. stanleyi*, *Coccophagus rusti*, *C. pulvinariae*, were introduced by Compere from China in 1937 and the first named is becoming rapidly established. Among the special characteristics which lead to its efficiency are the feeding of the females on the host scales and so preventing them from laying eggs, its great longevity and its remarkable reproductive powers. Over 740 eggs have been recorded from one female.

161. HALLIDAY, O. E.

632.752 : 634.3

Mealy bug infestation of citrus trees.

J. Dep. Agric. S. Aust., 1940, 43 : 847-51.

The troublesome species of mealy bug on citrus in South Australia are *Pseudococcus longispinus* and *Icerya purchasi*. Their habits are described. Control is obtained by spraying with white oil 1 gall., water 40 gall., or white oil 2 gall., nicotine sulphate (40%) 1 pint, water 80 gall. with the following provisos. A power sprayer in which the mixture can be constantly agitated and having a pressure of at least 300 lb. per sq. in. throughout the operation must be used ; the trees should not be sprayed when flowering and not until the oranges have reached one-third of their final size. Control by ladybird beetle and parasites is probably the most effective if it can be contrived. Bands made of sacking placed round the trunks cause the mealy bug to concentrate under the shelter where they are easily found by the ladybird which can itself there multiply with plenty of food and protection from its own parasites and predators. The nasturtium plant provides excellent protection for ladybird beetles during the colder months. [Has this any connection with the oft repeated tale that nasturtiums grown up apple trees will keep away woolly aphids?—ED.]

162. CROUS, P. A.

634.31 : 581.192 : 632.951

The reduction of acidity in Valencias by the use of arsenical sprays.

Citrus Gr., 1940, No. 82, pp. 1, 3, 5, 7.

The work was begun in 1936 on Valencias in Rustenburg by the Exchange Field Department, S. Africa. The acidity of Valencias and probably some other acid varieties, but not the sweeter Washington Navels, can be satisfactorily and safely reduced by spraying with a concentration of 2 lb. lead arsenate to 100 gall. of water, with or without a spreader. The most effective time for S. Africa is in December or January. There is a carry-over effect which lasts for 3 years. The sprayings do not significantly affect yield of fruit per tree, juice content, soluble solid content of the fruit, arsenic content, vitamin C content or carrying quality of the fruit.

163. SWANSON, P., AND OTHERS.

633.492 : 577.16

Effect of fertilizing treatment on vitamin A content of sweet potatoes.

Food Res., 1940, 5 : 431-8, bibl. 14.

The average concentration of vitamin A in Prolific sweet potatoes was found by bioassay to be 23 international units per gramme. The type of fertilizer used did not significantly affect the content.

164. WEBSTER, C. C. 633.85

Notes on the cultivation of tung oil trees.

Quart. J. Nyasaland Tea Ass., 1940, Part I, 4: 3: 16-20, bibl. 10; Part II, 5: 1: 5-11, bibl. 1; Part. III, 5: 2: 6-10, bibl. 5.

I. The results of tung oil cultivation in those countries where most progress has been made are briefly reviewed. It is seen that no country has yet established a profitable tung oil plantation. In all tropical countries where both have been tried *Aleurites montana* has been found more promising than *A. Fordii*. The countries mentioned as growing tung are U.S.A., Dutch East Indies, French Indo-China, U.S.S.R., S. America and many places in the British Empire.

II. Tung cultivation in Nyasaland now covers 4,356 acres much of which, however, whether of *A. Fordii* or *A. montana*, is not altogether satisfactory, partly, it is suggested, owing to enforced lack of attention through the prior claims of other crops on the labour available. The plants are raised from seed, which often germinates badly if imported, no satisfactory method of storage having been yet evolved. Nursery grown seedlings can be transplanted to the field with ball of soil attached when about 5 months old or 9-15 inches high, or they can remain in the nursery for a year and be cut back and put out as stumps. As stumps they require less care in handling and can be planted out in the dry season when labour is more available. There seems little difference between subsequent growth of seedling and stump. Sowing at stake is cheaper but uncertain. The question of optimum spacing has yet to be worked out. 30 × 35 feet is suggested for *A. montana* with no thinning of trees for the first 12 years and then only to a small extent, and for *A. Fordii* square planting 25 to 28 ft. apart with subsequent removal of alternate trees 8 to 12 years later. Trees to be thinned should be first ringbarked and allowed to die before removal to check the possible spread of *Armillaria* root rot. Inter-cropping young trees is probably beneficial if an uncropped space is left round each trunk; later a cover crop is desirable. Several of these are discussed. Yields per acre on the experimental plots at Zomba are variable, but over a five-year period *A. montana* from 3-8 years old averaged 663 lb. of dry seed per acre. *A. Fordii* averaged 437 lb. under the same conditions.

III. The possibilities for the production or improved planting material are discussed. There is considerable difference in yield between individual trees and much of this can be traced to the variation in the percentage of female blossom borne by individuals. The usual methods of improving the race by selection and crossing are mentioned. The section on vegetative propagation shows that propagation by budding and grafting is not difficult, the Forkert method* being the most successful for budding. Rooting from root cuttings and stem layers is not easy, but has been done in Russia and by the author.

165. LE ROUX, J. C. 633.85

Tung oil.

Fmg S. Afr., 1940, 15: 252.

The reason for the unsatisfactory condition of many of the tung oil trees (*Aleurites Fordii*) in South Africa is attributed to poor parentage and inherent variability of the trees in the early plantings, unsuitable soil, cultural neglect, insect and storm damage. Tung requires a deep, well-drained and slightly acid soil, with proper cultivation, manuring, etc. Summer rainfall in the absence of irrigation should exceed 30 inches per annum. Winter temperatures for *A. Fordii* should be low enough to ensure a rest period, but late frosts will cause damage. *A. montana* requires a rather warmer climate than *A. Fordii*.

166. FORBES, A. P. S. 633.85-2.4

Some tung oil diseases in Nyasaland.

Quart. J. Nyasaland Tea Ass., 1940, 4: 4: 6-10, bibl. 2.

The tung oil tree is only of recent introduction in Nyasaland but it has already acquired a few diseases which, while not yet of economic importance, nevertheless require watching. These are:—*Leaf spot* (*Glomerella cingulata* Stonem. S. and V.S.) attacking the old leaves generally or the young leaves of plantations not in harmony with the environment. *Die-back* (*Colletotrichum gloeosporioides* Penzig.) causing the die-back of twigs or branches. The diseased branch

* An illustrated description of the Forkert method is given in Vegetative propagation of tropical and subtropical plantation crops. *Tech. Commun. Bur. Hort. East Malling* 13, 1940. 3s. 6d.

should be cut off at least 9 inches below the farthest visible sign of the disease and the cut end tarred. *Die-back of transplanted seedlings.* A number of fungi have been found associated with this. They do not seem able to produce the condition in a healthy tree. The disease has only been found when *A. Fordii* was planted in the dry season. The seedling should be cut back to the collar and tarred, and infected material burnt. *A. montana* appears to be immune. *Collar crack* (*Armillaria mellea* (Vahl) Fr.) is the principal tung oil disease in Nyasaland. This is contracted by roots coming in contact with the infected roots of felled or decaying forest trees. There is no cure and the tree will be killed. Infected trees should be removed at once. Methods of ensuring against attack on new plantations by ringbarking the forest trees on the land to be cleared, at least 18 months before planting, are effective. They depend on the fact that *Armillaria* cannot exist in roots devoid of sugar. The ringing, if done properly, deprives the roots of this eventually without too suddenly killing the tree. *Collar rot* (*Ustilina zonata* Lev.) has only twice been found on dead tung trees. *An unknown disease* in which the symptoms are chlorosis, distortion of leaves and reduction in length of internodes has appeared. Most of the leaves fall and there is general die back.

167. SMEE, C. 633.85-2.7
Notes on a few insects attacking tung nut trees.
Quart. J. Nyasaland Tea Ass., 1940, 5: 2: 13-6.

168. POPENOE, W. 634.653
The avocado—a horticultural problem.
Trop. Agriculture, Trin., 1941, 18: 3-7.

The author reviews the history of the avocado from its first description by Martin Fernandez de Enciso in his *Suma de Geografia* in 1519 to the present day. It is largely a record of failure to establish unsuitable types in many South American and West Indian countries. The future of the avocado in the West Indies lies in crosses between West Indian and Guatemalan types. Such successful hybrids the author is convinced do exist though it is a fact that none has been made by man, so that their parentage on both sides cannot be definitely known. From the commercial standpoint the avocado in the Caribbean should be available during six or eight months of the year, it should be ready to place on North American markets in the winter when prices are highest, and it should contain 12-14% of oil. The tree is particular in the matter of soil which may account for its frequent failure. Stiff, impermeable clay is unsuitable and it dislikes wet feet even for a few days on the best avocado soil. It succeeds on sloping lands derived from soft limestone, on sandy loams and on clay loams provided there is no flooding.

169. PALMER, D. F. 634.653-2.6/7
The control of avocado insects and mites.
Calavo News, 1940, 14: 4: 5-6.

It is pointed out that avocado varieties are many, whereas standard citrus varieties are few. It is a mistake to base avocado pest control too extensively on the methods used for citrus since the tolerance of avocado varieties is not uniform to the degree that it is in citrus. *Brown mite* is best controlled by dusting 3 times yearly with good grade sulphur or spraying with 6 lb. wettable sulphur to 100 gallons water. The latter treatment gives the best control, the former is the cheaper. *Caterpillars* are destroyed by spraying with 4 lb. arsenate of lead to 100 gallons water plus a little spreader. When 20% arsenate of lead was added to the brown mite sulphur dust the sulphur seemed to act as a repellent to the caterpillars which ceased to feed and so escaped injury. *Thrips* are controlled with 1 pint nicotine Blackleaf 40 plus spreader to 100 gallons water. 10% nicotine dusts applied to trees covered with a light fumigation tent is often effective and obviates the need of a power spray equipment. *Latania scale* can only be treated by fumigation, difficult as this may sometimes be in the case of large trees. The fact that there are a great many host plants ranging from the underground corm of the gladiolus to the 100 foot high eucalyptus presents an awkward problem. The following observations are made which may assist future investigational work. *Latania scale* can be reared on banana squash. Scale control on trees treated with fungicides is very difficult for reasons unknown. Sulphur treated trees have shown injury after fumigation when comparable unsulphured trees have not, possibly because in combination the chemicals employed form sulpho-cyanide.

Ammonium sulpho-cyanide is an effective herbicide. Monterey cypress (*Cupressus macrocarpa*) a popular windbreak, is an important host for thrips and the source of many serious infestations.

170. SMOYER, K. M. 634.653-2.654
Avocado brown mite on the loose.
Calavo News, 1940, 14 : 4 : 2.

Sulphur dusting is recommended as the cheapest and one of the most effective methods of controlling the avocado brown mite. The greatest damage is done in hot dry weather when the infestation reaches the young shoots. The attack is insidious and may be dangerous before the grower becomes aware of it.

171. LACHOVER, D. 631.416.4
The movement of potassium in irrigated and fertilized red sandy clay.
Hadar, 1940, 13 : 193-5, 211-3, bibl. 18.

CARMIN, J. 634.37

Palestinian plants, their biology, diseases and cryptogamic inhabitants. *Ficus Sycomorus* L.

Acta Soc. bot. Poloniae, 1936, 13 : 93-103, bibl. 4.

TROPICAL CROPS.

172. FAHEY, H. 63
Re-adjustment of Trinidad's agriculture, its necessity, and policy required for same.

Proc. agric. Soc. Trin. Tob., 1940, 40 : 137-43.

In the course of this paper, in which the agricultural future of Trinidad is discussed, the theory is advanced that the decline in cacao yield apart from that resulting from impoverished soil is due to thrips attack and not to witchbroom. Many formerly heavy bearing trees are now classed as poor yielders and scheduled for replacement, whereas all that is really necessary to bring about recovery is the adequate control of thrips. Under present conditions replanting with known high yielding strains will result only in those high yielders going the way of their predecessors. Decline in yield has also been attributed to damage caused by falling shade trees. Such damage, however, is quickly made good by the tree. The fact is the falling trees create an environment that is favourable to thrips and it is these which cause the decline. Up to 1905, trees only made two changes of leaf a year with the result that the pods were adequately nourished. Now at least six changes a year may occur and the young leaves call on the reserves that should go to the pods. Success lies in the provision of replants immune to thrips, witchbroom and other important disease, and until such has been found there should be no replanting and the subsidy should be spent on building, shade, drainage, etc. Cacao is likely to decline in Brazil and West Africa from witchbroom and the virus of swollen shoot respectively. Any country that can replant with an immune, hardy, high yielder has a bright future.

173. MARTIN, F. J., FISHER, J. W. D., AND GLANVILLE, R. R. 631.459
Agricultural methods in Sierra Leone and their effect on the fertility of the soil.
Paps 3rd W. Afr. Conf., 1938, Vol. 1 (received 1940), *Sierra Leone Section*, pp. 1-6.

Much of the difficulty of preserving the fertility of the soil in Sierra Leone is attributed to the heavy rainfall causing run-off and soil wash during six months of the year, to the prevalence of tsetse fly preventing the keeping of cattle in the south and to the fact that the steep hill land in the north has already reached an advanced state of infertility. The method of farming is that of shifting cultivation which has resulted in the disappearance of all but 5% of the main forest. Robbed of this protection, land is open to the desiccating effects of the hamattan from the north and to the southward progress of "orchard bush" with its annual fires. Two methods are being tested to meet the threat of shifting cultivation : an attempt to replace it by a system of permanent farming on the high lands, which would entail the growing of a succession of food and manurial crops, and by the cultivation of the swamps. The latter is the most hopeful proposition and has already in twelve years achieved great success in easing the food problem and relieving the pressure on upland farming. The annual season of scarcity, which was a normal phenomenon from July to September, has been eliminated. The efforts by which this

has been brought about are briefly described. The wet season swamp crop is rice, but in the dry season farmers now raise sweet potatoes and garden crops generally. The most successful rice is G.E.B. 24. Fertility in swamps appear to be automatically maintained, probably by the annual deposit of mud suspended in the flood water and the rotting of the rice straw. Diminished yields occur in some districts but the fertility is restored by periodic digging without the need for fallowing. If properly cultivated there is sufficient potential rice land in the swamps to supply the whole country and provide for a considerable export. South Kanara, India, is cited as an example worth imitating. Here the hill tops and steep slopes are reserved for forest, the flatter slopes for permanent crops and the grazing of stock, and the valley bottoms and swamps, with the aid of water control, for the cultivation of rice and other annual crops.

174. DE GEUS, J. G. 631.8 + 631.4
De drie-eenheid die de plantengroei en-productie beheerscht. (**The three essentials for plant growth and yield.**)
Bergcultures, 1940, 14 : 1256-70.

The essential conditions for optimum plant growth and yield are (1) a satisfactory available supply of nutrient elements, (2) a suitable milieu in which the plant can obtain all it requires, (3) the importance of a correct balance between the different elements. This somewhat obvious statement serves the author as a text for a lengthy discussion on plant nutrition as it affects the growing crop.

175. COSTER, CH. 631.521
Algemeene beschouwingen over selectie van overjarige gewassen. (**Selection in perennial crops.**)
Bergcultures, 1940, 14 : 1328-35.

The paper opens with a general discussion of the principles of selection and gives some historical data. Of selection with perennial crops in the Dutch East Indies the work on quinine is the oldest, having started in 1865, that on sugar cane in 1885. The first work on *Hevea* does not date back more than 20 years, while that on tea is only just beginning. Results achieved have been to double or even treble the quinine and rubber yield, while the new tea clones promise an increase of 100-150%. In conclusion the methods employed in the selection of rubber and tea are described.

176. VAN DER VEEN, R. 631.874 : 631.84
Stikstofvoorziening door middel van groenbemesters. (**Green manures as sources of nitrogen.**)
Bergcultures, 1940, 14 : 578-81.

The author reviews very briefly some of the investigations on leguminous cover crops as providers of nitrogen to the soil. Both the ancient Greeks, he says, and the Incas of Peru were well aware of the benefits to the soil conferred by leguminous crops. Recent work in Java has shown that *Indigofera endecaphylla* and *Desmodium ovalifolium*, while useful as a source of nitrogen supply when cut and the prunings added to the soil, are unable to supply nitrogen to the soil *via* their roots when in growth, in fact, plants, e.g. coffee, grown among them are apt to suffer from root competition. *Leucaena glauca*, on the other hand, gives off through its root nodules important quantities of nitrogen which produce markedly beneficial results on the coffee beneath. The fact that coffee in Java so seldom suffers from nitrogen deficiency is attributed to the universal use of this tree as shade. This does not mean that all others can be ignored. On the contrary some produce so much mulch material that in the long run they enrich the soil though less directly, to a greater extent than *Leucaena*. Then again some strains of nitrogen-forming bacteria seem much less active than others. Experiments have already started with cultures of bacteria from a number of green manures with the object of studying this point and possibly of evolving strains of increased activity.

177. BECKLEY, V. A. 631.875
Compost-making in Kenya.
Emp. J. exp. Agric., 1940, 8 : 311-8, bibl. 9.

An account is given of the evolution of the various methods of composting now practised in Kenya. Difficulties due to the nature of the crop and the terrain have been successfully over-

come. The ingenuity exercised by some of the more enterprising farmers in dealing with their special problems compels admiration.

178. THOMPSON, A.

632.3/4 : 581.111

Notes on plant diseases in 1939.

Malay. agric. J., 1940, 28 : 400-7, bibl. 2.

A discussion on the diseases and organisms investigated or recorded on crops in Malaya. Reference is made to activities concerned with certain problems in this connexion. It is interesting to note that Roach's* method of injection for the determination of leaf bronze in oil palms was tried without result, since the injected solutions appeared to remain in the vascular strands and did not penetrate into the palisade tissue of the pinnae.

179. (SIMONS, R. D. G. TH.)

632.951.1

Invloed van derris, flit en andere insecticiden op menschen en dieren. (Effect of derris, Flit and other insecticides on man and animals.)

Bergcultures, 1940, 14 : 808, 810.

The article is a summary of information contained in two papers by Simons in the *Geneeskundig Tijdschrift voor Nederlandsch-Indië* (undated) entitled "Beroepscatarrhen, dermatitis en andere verschijnselen door derris en Flitdermatitis niet alleen door Flit" (Industrial catarrh, dermatitis and other phenomena attributed to derris, and Flit dermatitis not only caused by Flit). Various investigators have come to the conclusion that the toxic properties of derris are not solely due to the rotenone but also to other constituents. Fish are killed or paralyzed by crushed derris root thrown on the water. Insects are affected in various ways. For some species it is a case of delayed action; caterpillars, however, are very sensitive; derris is deadly to animal fleas but the human flea is little affected. Flies, mosquitoes and their larvae are fairly resistant, while some beetles even feed on it in storage. Warm-blooded animals such as cats, mice and guineapigs, if they eat or are injected with extract of derris root, are strongly affected, apparently in the central nervous system, and die of suffocation. Experiments on goldfish by the author gave the following results:—Derris powder sprinkled on the water of an aquarium killed the fish in 6 minutes. The concentration was 1 : 300 or in terms of rotenone 1 : 4,000. Rotenone alone in the same concentration worked less quickly. Rotenone-free ether extract acted more quickly than rotenone. Pyrethrum had the effect of quickly "paralyzing" the fish. Of these 4 materials only derris powder and pyrethrin had any inflammatory effect on the eyes of guineapigs. The effect on humans is described. Taken in the mouth, derris powder produces a numbing sensation extending to the throat, the power of taste disappears and in some cases causes headache. A healthy man can stand 80 mg. of rotenone while a man in poor health would be seriously inconvenienced by it. Workers in derris factories generally complain of lassitude, loss of taste, oppression in the chest, burning sensations in the mouth and throat, and headache. Other sensitive parts of the body are also affected but after a time a certain degree of immunity seems to be acquired. The author notes that for himself a few hours without a respirator in a derris factory is sufficient to cause nausea. Little is really known of the use of derris in medicine, i.e. in ointments and soap, and there is no evidence that it is an improvement on materials at present used, whereas it can often be a cause of eczema. In the second paper a number of proprietary insecticides having a petroleum or carbon tetrachloride base, to which are added such substances as coal tar, citronella oil, pyrethrum extract, nicotine, etc., are briefly discussed. It is concluded that vapour from these preparations was toxic to insects. Mosquitoes were killed in 10 minutes. Smoke from pyrethrin and tobacco was effective in small sealed rooms, but any draught at once disposed of the value of tobacco smoke. Contact with these preparations killed mosquitoes immediately but the tougher cockroach took 10 minutes to pass out. As far as the practical use of these preparations is concerned it seems that only direct contact is really effective. Their repellent value is small and, applied to the skin, e.g. against mosquito attack, they are fairly ineffective and if used frequently may cause injury.

* Roach, W. A. Plant injection for diagnostic and curative purposes. *Tech. Commun. Bur. Hort., East Malling*, 10, 1938. 5s.

180. TATTERSFIELD, F., MARTIN, J. T., AND HOWES, F. N. 632.951
Some fish-poison plants and their insecticidal properties.
Kew Bull., 1940, No. 5, pp. 169-80.

The distribution, native uses, and contact insecticidal properties of a number of fish-poisoning plants are described. None is of the same order of effectiveness as *Derris elliptica*. The most interesting from an insecticidal point of view are a vine from the British Solomon Islands, indistinguishable from *Derris trifoliata*, the leaves of which are toxic, *Dolichos pseudopachyrhizus* from Kenya, *Milletia pachycarpa* from India, *Tephrosia macropoda* from Natal and *T. Vogellii* from Uganda. [Authors' summary.]

181. COVELL, G. 632.951.1
The cultivation of pyrethrum in India.
Planters' Chron., 1940, 35 : 370-1, bibl. 1.

The sprayings of dwellings with pyrethrum insecticides has produced excellent control of malaria epidemics in South Africa, Delhi and elsewhere, and this is now so well recognized in India that its use is becoming widespread. The possibilities of growing pyrethrum in India so as to obtain a cheap supply are discussed. At present production is most advanced in Kashmir. The requirements seem to be a well-drained calcareous soil, and mild climate, high relative humidity and a long growing season. The quality of the flowers produced in India is superior to that of Japanese and equal to that of Kenya flowers.

182. TUCKER, R. W. E. 632.961
***Bufo marinus* L. in Barbados.**
Barbados agric. J., 1939, 8 : 145-50, bibl. 2.

Although the giant toad, *Bufo marinus* L., has long been established in Barbados and is now the dominant insect predator, its numbers are severely limited by lack of suitable breeding ponds, by intensive cultivation and by the larvae of giant water beetles (*Dytiscidae*). Large deep pools containing abundant water lilies for shade afford the most suitable breeding conditions though small fairly shallow cement ponds will serve for artificial breeding places provided they are kept clear of water beetle larvae, are shaded in some way and the toads are unable to obtain access to more congenial waters.

183. HAIGH, J. C. 632.51
The propagation of water hyacinth (*Eichhornia crassipes* Solms) by seed.
Trop. Agriculturist, 1940, 94 : 296-7.

Laboratory experiments indicate that the seed of the water hyacinth, a dangerous aquatic weed, will germinate after a period of dryness without the need of exposure to the sun. Under water the seed will remain viable for at least 5 years and probably much longer but there is a limit to the length of the period of dryness after which the seed will germinate. The water hyacinth reproduces itself vegetatively with extreme rapidity but the risk of spread by seed which may germinate should suitable conditions arise years after the water has been apparently cleared of the weed must be considered a real and permanent one.

184. VAN DER GOOT, P. 632.51 : 632.96
De biologische bestrijding van de cactus-plaag in het Paloe-dal. (Biological control of prickly-pear in the Palu valley, N. Celebes.) [English summary $\frac{1}{2}$ p.]
Landbouww., 1940, 16 : 413-29, bibl. 10.

An account is given of the destruction of an invasion of a prickly pear, *Opuntia nigricans*, in N. Celebes by the introduction from Australia of the cochineal insect, *Dactylopius tomentosus* Lam.

185. CELINO, M. S. 633.522-2.8
Experimental transmission of the mosaic of abacá or Manila hemp plant (*Musa textilis* Née.)
Philipp. Agric., 1940, 29 : 379-403, bibl. 45.

At present abacá mosaic is confined to one district in the Philippines where it is very destructive. The aphid vectors are *Rhopalosiphum nymphaeae* L. and *Aphis gossypii* Glover. In insect infection experiments the earliest symptoms appeared 8-10 days after infected aphids had fed

on healthy plants. The first visible infection consists of small yellowish-white dots on the unfurled or newly expanded leaf. The later stages are so pronounced as to be unmistakable even from a distance. Eight *Rhopalosiphum* are sufficient to inject an infective dose. Two hours feeding on infected material are necessary to obtain the virus which is only retained a short time and disappears from the aphid in the first feeding on healthy abacá. It is not transmitted to the aphid progeny.

186. CLEMENTS, H. F., AND AKAMINE, E. 577.15.04 : 633.61
Root stimulation in sugar cane (*Saccharum officinarum*) with special reference to the effects of ethyl alcohol.
Amer. J. Bot., 1940, 27 : 482-6, bibl. 2.

The rooting of sugar cane sets to be used for experimental purposes was greatly stimulated and ensured by pre-treatment with a solution of ethyl alcohol, especially at marginal temperatures. At favourable but not at marginal temperatures the phosphate ion is as effective as alcohol, especially in those sets which naturally contain small amounts of phosphates. The stimulation with alcohol is possibly due to its being a readily available high-energy containing food.

187. JOHNSTON, B. 633.61-1.84
Manurial trials with sugar cane. The effect of different times of application on the yield of cane and per cent sucrose in juice.
Barbados agric. J., 1940, 9 : 1-12.

The best time to apply nitrogenous manures to sugar cane in Barbados is shown to be in July at the beginning of the rainy season. The nitrogen then appears to have a much greater influence on the crop than at any other time. The practice of applying several small dressings instead of one larger one increases labour expense while reducing yield. As regards the per cent sucrose in the juice there is a trend for this to be lowered with increased yield but in the cases under consideration the increased yields per acre from the application of nitrogen more than counteracted this.

188. WILLIAMS, T. LL. 633.682-2.8
Progress made in the production of varieties of cassava resistant to mosaic disease.
Paps 3rd W. Afr. agric. Conf., 1938, Vol. 1 (received 1940), *Gold Coast Section*. pp. 45-60, bibl. 7.

The many varieties of cassava now under trial by the Department of Agriculture, Gold Coast, are classified into 31 sub-groups, each consisting of very closely allied strains and thirty-six imported varieties. Methods used for producing pedigree seedlings are described. Germination was increased from 13% to 40% by sowing the seeds in boxes of well-moistened sand, covered with glass and kept in the open. Percentages of fruit set, of fruits containing seed and of seeds germinating vary greatly with the variety. To test resistance to mosaic the seedling rows are alternated with rows of highly infected material. In the first season all strains attacked by the disease are discarded, in the second season cuttings of the surviving seedling strains are tested throughout the Colony for yield, hydrocyanic acid and palatability. Any seedlings not attacked by mosaic at any station, unless otherwise undesirable, are retained for further trial. Also retained are seedlings only lightly attacked, appearing tolerant and giving a good yield. The survivors in the 4th year are tested for yield against local varieties. Peculiarities of mosaic are : the incidence is greater on the coastal plains and fringing forest than in Ashanti ; infection mostly takes place in the wet season ; the same strain varies in susceptibility in different parts of the country.

189. ALLEN, E. F. 633.689
The cultivation of *Colocasia esculenta* (L.) Schott in Malaya.
Malay agric. J., 1940, 28 : 392-8, bibl. 5.

The cultivation and uses of this aroid, widespread throughout the tropics, are described for Malaya where in South Perak it is known as keladi China. Although it is always available in the local vegetable markets the European seldom uses it. An editorial note points out the need

for increased use of the many palatable native vegetables with a view to the reduction of imports under war conditions.

190. SHEPHERD, E. F. S. 633.689-2.19
Cocoyam root rot in the Gold Coast.
Paps 3rd W. Afr. Conf., 1938, Vol. 1 (received 1940), *Gold Coast Section*, pp. 83-6.

Cocoyams comprise varieties of *Xanthosoma sagittifolium* Schott and a variety of *Colocasia antiquorum* Schott. A root rot disease has developed of which the symptoms are: yellowing and shrivelling of the leaves, a reddening and finally blackening of the roots, with dieback at the tips accompanied by wet rot. The plant dies. Facts so far ascertained are that cocoyams in garden compost are not affected and can by no means be artificially infected, and diseased plants transferred to garden compost recover. Escapes growing in uncleared land in affected areas are quickly attacked and destroyed. Ordinary soil mineral deficiencies are not related to the disease nor is the soil reaction. Denitrification, however, assisted by the rotting bush roots left in the soil after clearing, is a possible contributory cause. The disease is obviously related to some soil condition produced by clearing. Various aspects are discussed and the author concludes tentatively that the soil conditions after the bush has been cleared tend to make *Rhizoctonia Solani* particularly virulent and that this condition may last some years. Further experiments are in progress. All attempts to control the disease have failed.

191. PARK, M., AND FERNANDO, M. 633.71-2.4
Some studies on tobacco diseases in Ceylon. III.* The effect of the time of spraying and of the nature of the fungicide on the control of frog-eye (*Cercospora Nicotianae* E. & E.)
Trop. Agriculturist, 1938, 90 : 323-40, bibl. 9.
IV. The economics of field spraying for the control of frog-eye (*Cercospora Nicotianae* E. & E.)
Ibidem, 90 : 341-7, bibl. 3.
 PARK, M., PAUL, W. R. C., AND FERNANDO, M.
VI. The effect of pruning and of the application of fungicides on the control of frog-eye in the field.
Ibidem, 1940, 95 : 8-15, bibl. 14.

III. The date on which spraying tobacco against frog-eye (*Cercospora Nicotianae* E. & E.) in Ceylon was most effective was 27 January because it then contained the maximum proportion of topped plants, i.e. the maximum leaf area, compatible with a minimum infection level. The most efficient fungicidal formulae of 5 were (No. 1) proprietary colloidal copper 4 oz., proprietary spreader $\frac{1}{4}$ oz., water 4 galls, and (No. 5) ammoniacal copper emulsion:—copper sulphate $2\frac{1}{2}$ oz., soft soap 13 oz., ammonia 66% 1 oz., water 4 galls. The difference in efficacy between (1) and (5) was not significant.

IV. Unlike the position in other countries frog-eye, unless checked, is likely to be the limiting factor in the growing of cigarette tobacco in Ceylon. The cost of spraying including all charges and using one of the fungicides mentioned above should not exceed Rs. 35 per acre, and the extra profit per acre would greatly exceed this cost. A further reduction could be made by the use of home-made instead of proprietary copper sprays but the performance of the home-made samples of the two recommended sprays was rather inferior, and the certain, though small, amount of spray injury caused by them might prejudice planters against spraying.

VI. In tobacco growing, priming consists in the removal of over-mature "sand leaves" with the object of ventilating the base of the plant and of diverting as much of the available nutrients as possible into the commercially valuable leaves. The over-mature leaves often carry numerous frog-eye lesions and it was thought that their removal would result in a reduction in the volume of infective material. In view of the difficulty of water transport in the dry tobacco area, trial was made with dusting instead of spraying against *Cercospora Nicotianae* E. & E. It was found that high priming lessened the severity of frog-eye. Copper-lime dust, though not as

* For Parts I, II and V, see *Ibidem*, 1937, 88 : 153-68, 1937, 88 : 266-82 and 1938, 91 : 338-44; *H.A.* 8 : 221 and 9 : 617.

effective as a colloidal copper spray, produced a large and significant reduction in the intensity of frog-eye.

192. VAN EMDEN, J. H. 633.72-1.541
Een nieuwe entmethode voor thee. (A new method of grafting tea.) [English summary 1 p.]
Arch. Theecult. Ned.-Indië, 1940, 14 : 16-25, bibl. 1.

The method described is a kind of veneer rind graft in which the stock is not cut back until the graft has taken; the scion also is prepared rather differently. The method can be used on older trees. The scion carrying a single, partly clipped leaf and a bud is cut from a green shoot and a length of cambium is exposed by removing a strip of bark 2-3 mm. wide. A similar strip is removed from the stock bark by means of two long parallel downward cuts united at the apex by a transverse incision. The bark enclosed within these strips is peeled down and cut off and the prepared edge of the scion put in its place. The whole is bandaged with budding tape as tightly as possible, the leaf and bud protruding from the bandage. The open spaces on either side of the leaf are sealed with grafting wax. If after 10 days the leaf is still attached to the scion, a strip of bark is taken off transversely from the stock just above the graft. In another 10 days when the bud has started to swell, the stock may be cut off above the graft. The method has advantages over crown and side grafting but will probably only serve as a useful auxiliary to budding.

193. EDEN, T. 633.72
Studies in the yield of tea. *IV. The effect of cultivation and weeds on crop growth.
Emp. J. exp. Agric., 1940, 8 : 269-79, bibl. 17.

The effect of intensive cultivation and of leaving a selected weed-cover in a tea experiment is described with respect to (a) soil resistance, (b) volume and distribution of roots, and (c) yield. Tea soils under cultivation programmes of very varying intensities show a characteristic pattern in their resistance to the Culpén soil-probe at depths up to 24 inches. A surface crust forms as a result of continual treading, and this crust is an important predisposing cause of erosion. Beneath the crust the soil remains porous for a considerable time after cultivation. Root distribution remains unaffected by differences in cultivation but root volumes are markedly affected. Intensive cultivation probably decreases root growth. A technique of root sampling is described. Over a 3-year period weeds reduced yield by 8.6% and intensive cultivation by 5.3%. The effect of bulk manure on yield and root growth can be explained only on the assumption that the mechanism is entirely nutritive and that bulk manures do not stimulate root growth in any other special way. The bearing of these results on plantation practice is discussed. [From author's summary.]

194. v.D., G. 633.72-1.459
Bodemonderhoud in theezaadtuinen. (Soil conservation in tea seed gardens.)
Bergcultures, 1940, 14 : 1147-8.

The first essential in tea seed gardens is that the soil should be free from weeds. On sloping ground, however, clean weeding results in erosion. At the experiment station, Pasir Saronggé, in Java, the difficulty was overcome by running narrow strips of turf in squares $2\frac{1}{2} \times 3$ metres and 3×4 metres round each young and old tree respectively and clean weeding the space enclosed within the strips. The turf was merely laid on the surface where it soon rooted. Such soil as was washed down the slope was retained by the turf strips and a succession of terraces was built up automatically, quickly at first, and then more slowly as the ground gradually became more level. The final levelling can be greatly assisted by fallen leaves and by burying weeds at the upper ends of the squares and spreading the excavated soil on to the lower side of the square above. This should be done every three months till the ground within each square is level. On the ground in question the original slope was one in seven. The grass of the turf

* I. Eden, T. The experimentation errors of field experiments with tea. *J. agric. Sci.*, 1931, 21 : 547-73; *H.A.*, 1 : 280. II. The seasonal sampling and variation in yield and mineral composition of tea leaf. *Ibidem*, 1932, 22 : 386-95; *H.A.*, 2 : 174. III. Field experiments with potash and nitrogen in relation to the pruning cycle. *Emp. J. exp. Agric.*, 1935, 3 : 105-14; *H.A.*, 5 : 284.

ridges grows badly under shade but the sod itself remains in place and holds the slope intact. Although actual recorded data are not available it seems that the seed yield of the gardens was greatly increased by this terracing.

195. DE HAAN, I., AND SCHOOREL, A. F. 633.72:2.19 : 631.83
Kaligebrek in de theecultuur. (**Potassium deficiency in tea growing.**) [English summary 1 p.]
Arch. Theecult. Ned.-Indië, 1940, 14 : 43-81, bibl. 24. *Bergcultures*,* 1940, 14 : 1292-5, 1336-9.

I. The symptoms of potassium deficiency in tea are abnormal leaf fall of the basal branches and reduced formation of young leaves at the shoot tips, and the drying up of the leaf margin (leaf scorch) which gives the garden a poor, thin appearance. The roots become long and soft and the wood is also soft. The symptoms first appear in the older leaves. An account of the rôle played by potassium in plant nutrition follows, and the value of ash and soil analysis in determining the degree of deficiency are discussed in relation to tea.

II. The restoration of potash-deficient land is discussed. A series of experiments with tea to combat such deficiency are described. Results are at present meagre, but it seems that small quantities of potash applied to the soil were ineffective, that larger quantities were of more use and in such case the leaf production and K_2O content of the leaves increased and that on land not noticeably deficient in potash added potash had little effect. In some cases potash had a retarding effect.

196. DEIJES, W. B. 633.72 : 577.16
Vitamine C in theeblad. (**Vitamin C in the tea leaf.**) [English summary 1 p.]
Arch. Theecult. Ned.-Indië, 1940, 14 : 1-15, bibl. 15.

Fresh tea leaf contained more than 4 mg. of ascorbic acid per gramme of dry matter, which decreased during withering to about 20% of the content of the original fresh leaf. Steamed fresh leaf produced green tea containing 70% of the vitamin C originally present.

197. GADD, C. H. 581.144.2 : 632.4 : 631.542.24
Ring-barking of trees and root diseases.
Tea Quart., 1940, 13 : 117-23, bibl. 6.

Ring-barking of trees before felling is a method of checking the spread of *Armillaria* root disease. In the ring-barking method advocated a wide strip of bark down to the wood is removed in a complete ring round the trunk. This breaks the channel down which the elaborated foods are passed from leaves to roots but does not interfere with the upward movement from roots to leaves of water containing raw food materials in solution. The roots, existing on their reserves, die of starvation, they can no longer supply the branches, which then die of water shortage as during drought. All adventitious growth below the ring or bark regeneration must be checked. The whole principle is that the crown should kill the roots by compelling them to exhaust their reserves by failing to supply them with food, especially starch, without which last *Armillaria* cannot exist.

198. LAMBERS, H. R. 633.73
Impressions of coffee growing in East and Central Africa.
E. Afr. agric. J., 1940, 6 : 32-3, 74-6, bibl. 1.

Dr. Hille Ris Lambers of the Malang Experiment Station, Java, recounts his impressions gathered during an extensive tour of the African coffee-growing districts. There is often little or no shade. *Leucaena glauca*, the common shade tree of Java, is not suited by the soil conditions. In dry districts shade is sometimes used, and to avoid competition with the coffee for the available moisture this is often provided by split sisal poles placed at various distances on wires. Certain physiological diseases, especially black tip or hot and cold disease of the British, brûlure of the Belgians, are caused through sudden changes of temperature which are intensified by lack of shade. M. Stoffels of the Mulungu Station, Kivu, Belgian Congo, has ascertained that variability of production in *arabica* coffee is greatest in the green-tipped plants. The brown-tipped are more resistant to brûlure and selected lines have a fairly high yield. The brown-tipped varieties exhibit the characteristic in the terminal leaf at an early age, enabling selection to be carried

* The *Bergcultures* version is condensed from that of the *Archief*; there is no English summary.

out in the nursery beds. In Kivu banana trash is much used as a mulch, but interplanting bananas and coffee sometimes led to the coffee suffering. *Pennisetum* was used as a mulch in Kenya, Uganda and the Belgian Congo and often the results obtained with this grass were most striking. Some notes on the methods of pruning commonly practised are given. The method of cutting into a stump to be topgrafted at an angle of 45° below the site of the graft, after which the cut is covered with an asphalt preparation "Shelmac", much interested the author. This practice prevents die-back of the grafted stumps which otherwise frequently occurs. This stumping must be done at the beginning of the growing season when there is only a small sap flow and the cut should be made above a sucker or offshoot to reduce the shock to the root. In the Belgian Congo a good fringe of branches is left below the graft on a topworked tree, among other reasons in order to protect the young scion from the weather. These are gradually removed as the scion grows. The methods of selection and breeding in the various regions visited receive attention and notes are given on some of the varieties met with. Emphasis is laid on the possibilities in breeding afforded by some of the coffee species and trials with them are being laid out in Java.

199. MAYNE, W. W. 633.73
Memorandum of the coffee scientific department of the United Planters Association of Southern India.
Planters' Chron., 1940, 35 : 303-7.

A review is given of the research work being carried out by the organization mentioned in the title in association with the Mysore Coffee Experiment Station. (a) *Leaf disease and its control.* The only apparent remedy for leaf disease (*Hemileia vastatrix*) is the evolution by isolation and multiplication of a strain of disease-resistant coffee. The disease is said to be the most important single cause of reduced yield and lowered vitality of *Coffea arabica*. Meanwhile the following work on palliative measures is in progress. Studies on the effects of different spray volumes and nozzle sizes, on reduction of spray mixture strength without loss of efficiency and the comparison of proprietary fungicides to assess accurately their efficiency relative to bordeaux mixture. (b) *White borer and its control.* So far stem rubbing still remains the best means of control [the beetle will not oviposit on smooth surfaces.—ED.], research is directed to increase its efficiency by improved timing and to the search for repellants combining also ovicidal properties. Fresh studies on the life history and habits of the pest have been undertaken. (c) *Tree growth and development in relation to yield.* Close and detailed observation is being made of tree behaviour with a view to a clearer understanding of the results of cultural treatment. There is at present among growers confusion with regard to pruning coffee and in the interpretation of results of manuring. Much of this is due to lack of appreciation that the needs of the trees vary according to their condition, i.e. whether exhausted or cropping heavily or lightly. (d) *Establishment of young plants in difficult areas.* Replacement of many of the trees seems the only solution of many of the problems of the coffee industry. In some districts re-establishment is difficult. The pest complex and the predisposing soil and plant factors remain to be disentangled and this work is hampered by considerations of available time and finance. Meanwhile some progress has been made in the abandonment of certain practices which were obviously useless and in modifications in the type of plants and in the time of planting which have proved useful. The value of fertilizers in establishing young plants where soil pests permit is indicated. (e) *Factors affecting yield in robusta.* Problems connected with this crop, the planting of which is increasing in South India, are the frequent crop failure and the great heterogeneity of the planted areas. These are being attacked by investigations on yield, fruit setting and vegetative characters. A major requirement seems to be drought-resistance.

200. ALLNUTT, R. B. 633.73-1.535
The possibilities of vegetative propagation of coffee in Tanganyika.
E. Afr. agric. J., 1940, 6 : 4-5, bibl. 4.

The propagation of *arabica* coffee by cuttings has passed beyond the experimental stage. At the Coffee Research Station, Lyamungu, Tanganyika, an average of 65.79% cuttings rooted in 4 different media, the average time taken being about 17 weeks. At the present time with quite a modest set of propagating frames 1,000 cuttings per month are being produced. The performance of trees raised from cuttings has yet to be proved, but if they carry on the high

performance of the parent trees there will be a big demand for them. The possibilities of commercial raising of coffee from cuttings by local nurserymen is discussed. It is also shown that the difficulty of providing large quantities of cuttings from a selected clone without injury to the plants is less serious than might at first sight appear, because any clone showing promise would have been multiplied during the years of observation and there would be a number of progeny available from which cuttings might be taken. In the case of bud or graft wood the initial difficulty would be greater. The number of hardwood cuttings obtainable from a tree over a given period is much less than that of softwood cuttings.

201. MAYNE, W. W. 633.73-1.8

Investigations on the nutrition of *Coffea arabica* L.

Planters' Chron., 1940, 35 : 327-30, bibl. 3, and in slightly abridged form in *Trop. Agriculture, Trin.*, 1940, 18 : 13-4.

A summary is given of recent work in Java* and at the Lyamungu Coffee Research Station, Tanganyika, in which the technique of water culture and sand culture has been applied to the study of nutrient requirements of arabica coffee. Symptoms resulting from various deficiencies are described. The chief points brought out are the necessity for adequate supplies of calcium, sensitiveness to iron deficiency, intolerance to alkaline conditions and the importance of boron.

202. SCHWEIZER, J. 633.73-1.543.1

Over lamtoro-soorten als hout-leveranciers in een koffiëaanplant. (*Leucaena* spp. as sources of wood in a coffee plantation.)

Bergcultures, 1940, 14 : 1069-77.

The characters of *Leucaena glauca*, the common shade tree for coffee in the Dutch East Indies, *Leucaena pulverulenta* and *L. glauca* × *L. glabrata*, are discussed in connection with the provision of a firewood supply combined with adequate shade. *L. glauca* has a hard durable wood, the other varieties mentioned, while quicker growing, are somewhat softer. The reasons for this are discussed. In budding the other varieties on *L. glauca* some interesting stock/scion influences were observed. In one year *L. pulverulenta* budded on 3-year-old *L. glauca* will develop a stem as thick as that of the stock. After this the old bark on the stock appears to "burst" and can be observed as darker patches in the new light-brown tissues. After 2 years the *L. glauca* budded stock is 50% thicker than the unbudded controls, in a further 2 years it is twice as large as the unbudded stock. *L. glauca* when budded with *L. pulverulenta* or *L. glauca* × *glabrata* had after 2 years a higher specific weight and a higher water content in the stem sections than the unbudded controls. After 4 years differences in the influence of the two scions began to emerge, *L. pulverulenta* proving the stronger in the direction mentioned. In five years *L. glauca* stock budded with *L. pulverulenta* becomes five times heavier than *L. glauca* stock budded with *L. glauca*. Chemical changes in the bark and wood of the *L. glauca* stock are also brought about by the other *Leucaena* scions. Discussing the plantation management of these various *Leucaena* it is stated that $\frac{1}{2}$ the sunlight can penetrate through *L. glauca* branches, $\frac{1}{4}$ through *L. glauca* × *L. glabrata*, and only $\frac{1}{4}$ through *L. pulverulenta*. On the whole *L. glauca* × *L. glabrata* is the most suitable of the 3 for coffee shade for the following reasons :—It supplies as much firewood as *L. pulverulenta*, the shade is equally lofty, better diffused and less dense, it regenerates equally well after pruning, the wood is harder and tougher than *L. pulverulenta*. The supersession of the ordinary *L. glauca* as a shade for coffee by this new hybrid should be only a question of time.

203. LAMMERS, R. P. 633.73-1.543.1

Een en ander over nieuwe lamtoro-vormen. (Notes on the new *Leucaena* varieties.)

Bergcultures, 1940, 14 : 1168-71.

The merits of *Leucaena glauca*, the common shade tree for coffee in the Dutch East Indies, are :—It is a cheap source of nitrogen ; it is easily pruned and tolerant of hard cutting ; the roots go deep and extract nitrogen from the lower strata which is made available to the coffee in the topsoil through leaf fall and prunings ; there is no root competition with the coffee. It has, however, some disadvantages. It fruits so heavily that leaf formation is retarded just

* s' Jacob, J. C. Voedingsphysiologische onderzoeken bij *Coffea arabica* L. (Physiological experiments on the nutrition of *C. arabica*). *Arch. Koffiecult. Ned.-Indië*, 1938, 12 : 1-48, bibl. 51 ; *H.A.*, 8 : 1210.

at the moment when it is most required for shade ; to counteract this effect the tendency is to plant closely with the result that in the wet season too much shade is cast ; the clearing away of the numerous seedlings which spring up everywhere entails much extra work ; it is a host plant for the coffee mealybug, *Pseudococcus citri*. On many soils it regenerates weakly. Non-seeding *Leucaena* have been produced. The F_1 generation of the cross *L. glabrata* \times *L. glauca* and plants produced from buds of non-flowering *L. pulverulenta* on *L. glauca* stocks are scanty seed bearers. Investigation of *L. pulverulenta* showed it to be heterozygous and to cross easily with *L. glauca*. At present therefore it is not desirable to propagate by seed until this has been fixed and suitable types selected. Natural crosses between *L. glauca* and *L. pulverulenta* produced an F_1 generation which grew faster than *L. pulverulenta* seedlings. Budded plants grow rather less quickly than the seedlings. The F_1 generation also produced trees which flowered only once, early in the year. These are being selected as clonal types. The situation at present is that a choice is available of several new and superior *Leucaena* forms from which, by crossing and selection, it is hoped to evolve strong-growing seedless varieties, immune to the coffee mealybug.

204. LE PELLEY, R. H., AND GILLETT, S. 633.73-2.7
Coffee pests and related cultural problems.
Mon. Bull. Coffee Bd, Kenya, 1940, 6 : 134-5. Reprinted from *E. Afr. Standard*, Oct. 18, 1940.

A number of cultural problems of coffee in Kenya are discussed. Although the activities of the recently introduced mealy bug parasite are becoming very effective, banding of coffee against mealybug should not be discontinued in severely infested blocks. It is possible to strike a happy mean which will ensure sufficient banding to assist the parasite where necessary, while reducing or discontinuing it in blocks where the parasite appears to have gained control. Thus banding is not yet superseded and from this it follows that suckers cannot yet be allowed to start so close to the ground that banding the main stem is impossible. Capsid (*Lygus*) increases markedly when the coffee flower buds on which it feeds are present. If the coffee flowers generally and heavily, most of it will set before the capsid can increase enough to cause appreciable damage ; intermittent small flowerings favour its increase. While it may not be possible under Kenya conditions always to ensure this general flowering the aim may be furthered by the following precautions. *Delayed pruning*. Pruning should never be carried out in the higher and wetter elevations till after flowering, or much unnecessary vegetative growth will result from buds that would otherwise have flowered. *Controlled cropping*. This is especially necessary at the lower elevations. Trees which overbear will be thrown out of balance and future flowerings will be spasmodic and uniform throughout the plantation. *Deep forking*. In the wetter districts deep forking in order to do a certain amount of root damage 2 or 3 months before flowering is expected to be helpful. *Antestia* is a native insect pest surviving in a wide range of conditions. It causes much damage by infecting the plants with a fungus which rots the coffee bean. Direct control alone can prevent occasional damage but cultural methods may greatly assist to keep the insect in check. In hot dry districts and during spells in wet districts *Antestia* feeds on soft green or ripe berries, in wet districts on hard green berries. Thus the recommendation to avoid intermittent flowering applies here also. The requirements of the insect are protection from great heat and from cold and plenty of moisture. Thus it increases most in the shelter of bushes with thick foliage or under heavy shade. Open pruning is a remedy. This can be obtained without causing too great a flush of vegetative growth by cutting back old wood to the current season's cropping and by the removal of some of the latter if there is danger of overbearing. Thinning, i.e. the removal of surplus young vegetative wood is of the greatest importance. In the higher elevations coffee plantations are often too heavily shaded especially with *Grevillea robusta*. Judicious pruning of this tree should always be, but seldom is, regularly carried out.

205. SUBRAMANYAM, V. K. 632.76 : 633.73
Report on coffee stem borer work in Coorg.
Planters' Chron., 1940, 35 : 283-9, bibl. 1.

The life history and possible control measures for the coffee stem borer, *Xylotrechus quadripes*, in South India are described. The control measures consist in rubbing the tree trunks every

15 days from the end of October to mid-December to reduce ovipositing, one rubbing being associated with a stem wash such as Mortegg. Heavy shade, especially by the lower canopy, is a deterrent. Other control measures are under investigation, including stomach poison and the closing of the bark crevices by some powder in suspension.

206. SERRALLÉS, J. J., AND VÉLEZ, M. 663.93 : 338
Price of coffee in Puerto Rico from 1900 to 1938.

Bull. Puerto Rico agric. Exp. Stat., Río Pedras, 54, 1940, pp. 24.

Coffee farming is the second most important type of farming in Puerto Rico. The area under coffee comprises just over $\frac{1}{5}$ of the total farm acreage and the value of land and buildings on coffee farms was just over $\frac{1}{5}$ of the total value of land and buildings of all farms in 1935. The farm value of the total coffee crop rose from about \$6,000,000 in 1920-21 to more than \$10,000,000 in 1926-27. It then fell to \$1,400,000 in 1929-30. The average yearly farm value for the period 1933-34 to 1937-38 was about \$2,400,000.

207. DUCKE, A. 633.74
 As espécies brasileiras de cacau (gênero *Theobroma* L.) na botânica sistemática e geográfica. (**Systematics and distribution of Brazilian species of cacao (*Theobroma* L.)**.) [English summary 2 pp.]
Rodrigüesia, 1940, 4: 265-76, bibl. 7.

A description and key (also in English) is provided for the 9 species of *Theobroma* indigenous to Brazil. All produce edible seed but *Theobroma Cacao* is the only one cultivated. These cultivated Amazonian trees are even now scarcely to be distinguished from the wild form. There are some interesting photographs of the various species.

208. VOELCKER, O. J. 633.74-1.521
A review of cacao selection in the Cameroons.
Trop. Agric., Trin., 1940, 17: 223-5.

A short account of some results obtained by selection in cacao on the Victoria estate of the Westafrikanische Pflanzungs-Gesellschaft in the British Mandated Territory of the Cameroons by the manager, Herr Mylord. The period of selection was only two years and the results unfortunately have been lost as the company has ceased to plant cacao. The selections were made in 1930-31 from 5,440 trees of the Trinitario Complex, planted in 1907 and 1908, spaced 4 x 4 metres. Twenty-nine trees were finally selected of which the best is yielding at the rate of 33 cwt. per acre and the worst at 29 cwt. The average yield on Cameroon estates is only 2 cwt. per acre. In raising seedling cacao it was customary to choose large red pods at random from the heap on the assumption that trees bearing large red pods give larger beans and a greater yield of wet cacao and are less susceptible to black pod disease. Mylord found that with his trees the green podded trees in general gave a higher yield of wet cacao than the red, although individuals of the latter class are among the heaviest yielders. Pod colour appeared to have no influence on susceptibility to pod disease. The results are compared with and found very similar to those obtained in Trinidad with the Trinitario Complex.

209. WRIGHT, J. 633.74
Notice concerning the central cocoa research station at Tafo, Gold Coast.
Paps 3rd W. Afr. agric. Conf., 1938, Vol. 1 (received 1940), Gold Coast Section, pp. 65-7, bibl. 2.

A brief outline is given of the present condition and purposes of this recently established research station.

210. ANON. 633.88.32.491
Cultivation of castor seed in Brazil.
Bull. imp. Inst., 1940, 38: 321-4, bibl. 3.

Brazil is now the main exporting country for castor oil seeds *Ricinus communis* L. The plant does well in the coastal districts and where the rainfall is well distributed and the climate moist and tropical. The plant though usually cultivated as an annual will often survive for several years. There are 3 general types, tall, medium and short, the extremes being 30 ft. and 5 ft. respectively. Desirable qualities are pods which do not shatter before harvest and a seed oil

content of about 60%. The short varieties are non-shattering as a rule. Results depend largely on choosing a variety suitable to the country and agreeable to the oil trade, thus large seeded sorts are not approved. Good average land, especially sandy loam containing humus and lime and capable of being ploughed to at least 9 inches, is satisfactory. Flat valley lands and land bordering rivers give good results though strongly calcareous clay, peaty, sandy, water-logged or cold soils are inimical. Freshly cleared forest land should first be used for another crop or the oil plant will run to leaf. Castor oil responds to farmyard manure or to a green manure. A crop of 1,800 lb. of castor seed per acre will remove from the soil approximately 54 lb nitrogen, 22 lb. phosphoric acid, 16 lb. potash, 5 lb. lime. A suggested dressing for an average soil per acre is 8 tons farm manure plus 90 lb. each of superphosphate of lime and potassium chloride, or 900 lb. castor seed cake, 180 lb. superphosphate of lime and 90 lb. potassium chloride. Deep and thorough preparation of the soil before planting, weeding until the crop is high enough to shade the land and topping at 3 ft. are other processes which will increase yields. The crop is usually harvested by cutting off the capsules when about three-quarters of the fruits are ripe; the remaining capsules will ripen when drying. Earlier cutting results in loss of yield of oil. The seed falls from the capsules when the latter are dried, usually in the sun, but the process may be assisted by threshing. After winnowing the crop is bagged and may be graded for size. For storage a dry ventilated building is necessary. Pests and diseases are not troublesome, a form of *Botrytis* being the most dangerous.

211. BURNS, W.

633.88.51

Cinchona* cultivation in the Netherlands-Indies.

Indian Fmg. 1940, 1 : 311-7.

The two species cultivated in Java to-day are *Cinchona Ledgeriana* and *C. succirubra*, the latter being used chiefly as a stock for *C. Ledgeriana*. Conditions best suiting *Cinchona* are a tropical hill climate with average daily temperatures from 15° to 25° C., rainfall about 3,000 mm. fairly evenly distributed over the year, and a well-drained virgin soil rich in humus. Old *Cinchona* land can be replanted after two or three years' rest, during which period it should carry leguminous crops. If grafted plants are used soil exhaustion is diminished. Propagation is by seeds, grafts and cuttings, the latter being seldom used. Very careful selection and re-selection is carried out with the plants supplying the grafts, the characters required being at least 10% quinine content, a quickness and good habit of growth, resistance to pests and diseases. The seeds are raised in walled and covered frame sheds, an aperture for light covered with oiled linen being left along both sides of the ridge pole. The seed bed is dry humus earth free from un-reduced organic matter; because of the small size of the seeds watering is by spray pump. The secret of success is maintenance of the correct humidity. As the seedlings grow the shed walls are removed gradually and replaced by bamboo trellis. The young plants are thinned, the thinnings being planted elsewhere, still under cover but with more light and in ordinary garden soil. All seedlings are transplanted to outdoor nursery beds within six months from germination. These transplants are still shaded with light roofs of fern which are raised as the plants grow, keeping always 10 cm. above them. Finally these protections are also removed. The seedlings can be grafted in about 18 months. The preparation of the land for new plantings is described. Manuring usually takes the form of green manure supplied by the hedges of *Leucaena glauca* which line the terraces. Farmyard and sulphate of ammonia and seed meal of *Leucaena* and kapok are also given. Pruning is aimed at keeping an unbranched single stem to two-thirds of the height in the older trees and one-third of the height in the younger. Pests and diseases are described. They are not numerous. The first yields are obtained from the prunings and later from the thinning and removal of too closely planted trees. Prunings and thinning are never carried out to increase yield. When the yield from these sources begins to decline is the most economical time to cut the whole plantation. In harvesting the tree is felled and the bark removed from every part of the tree thicker than a lead pencil, including the roots. The bark is beaten with a wooden mallet to facilitate removal. Drying is usually in ovens at temperatures of 60° C. and later 80° C. The three grades of bark are known as pipes, ribs and chips. Pipes are the longest pieces, usually curled (with assistance) through drying

* A translation of the greater part (omitting the historical and statistical) of von Blücher G. L. A., *Anbau der Chinarinde (Cinchona) in Niederländisch-Indien*. *Tropenflanzer*, 1938, 41 : 231-45; *H.A.*, 8 : 1225. The abstract was brief and a fuller one is now given.

into tubular form. Ribs are badly removed sections about 25 cm. by 1 cm. They are bundled in 25s, the binding being tightened during drying to keep them flat. Chips are produced by scratching off the bark of otherwise unsuitable sections. The roots produce only chips. The bark is dealt with by eighteen factories.

212. MANN, C. E. T.

633.912

Improvement in the quality of rubber planting material.

J. Rubb. Res. Inst. Malaya, 1940, 10 : 108-25, bibl. 7.

The general principles of the improvement of a perennial crop are briefly discussed and the effect of the improvement of *Hevea* planting material on the position of Malaya as a rubber-producing country is reviewed. An outline is given of the breeding and selection work of the R.R.I. of Malaya during 1928-39. The principal results obtained are:—the development by selection of clones yielding almost treble the average of the population from which the mother trees were chosen; the development by breeding between these clones of families of seedlings whose mean yields are greater than the clones from which they were derived; illegitimate seedlings from the best clones may give yields which are not appreciably inferior to those of their parents; from outstanding trees of the legitimate seedling families new clones have been made whose yields may be double those of the original clones from which they were derived. In conclusion it is shown how the results of this work are being applied to practice.

213. ZWEEDE, J. C.

633.912-1.532

Het splitsen van *Hevea*-kiemplanten. (Twinning *Hevea* seedlings.)

Bergcultures, 1940, 14 : 1271-5.

When expensive clonal seed has been obtained it is a frequent practice in Java to endeavour to increase the number of resultant plants by splitting the germinating seedling longitudinally down the centre. The author has discovered that stronger plants and quicker growth can be obtained by splitting the seedling just above the junction of the plumule and the cotyledons. This leaves the plumule intact on one section together with a cotyledon and half the radicle while the other section has a cotyledon and half radicle but no plumule. A fresh shoot will quickly arise in the angle of the cotyledon and the half without plumule will not lag very greatly behind its more complete twin. The sectioning is done before the cotyledons have emerged from the seed coat, though the plumule and radicle will have done so. The twinned seedling, still held together by the seed coat, is then planted. The author calls his method "Gambar", the older method "Ramaer". The seeds are laid on their sides for germination in sand covered with trash or straw. The beds are shaded from the hot sun and the coverings removed at night. After germination the plants still in the seed coat are transferred to nursery beds shaded with bamboo lattice work. Further cultural directions are given. The author concludes that twinning following his methods can be of considerable financial benefit. Abnormalities are very infrequent.

214. ASHPLANT, H.

633.912 : 577.15.04

Wound healing and bark renewal in *Hevea brasiliensis*. Growth-stimulating substances as aids.

Planters' Chron., 1940, 35 : 248-51, reprinted from *India-Rubb. J.*, January 1940.

The acceleration of bark renewal and the healing of wounds in *Hevea* by the application of such substances as palm oil or a mixture of cow dung and clay is discussed. The author was unable to discover that cow dung and clay were of any benefit, though if the plater were left on for any length of time a plentiful and unwanted supply of adventitious roots would develop on the upper lips of the wounds. Palm oil has been shown to have a definitely accelerating effect. Increases of thickness over the control trees of 25%-50% have been recorded, the improvement being most marked during periods when growth was generally slower and being less evident on estates where growth was generally good. The improvement is ascribed to two factors, a hormone factor increasing cambial activity and growth and a physical factor, namely the prevention of excessive evaporation of moisture from the thin-walled tissues exposed by the tapping operation. Distinction is drawn between renewal of the cambium proper containing the latex cells and the outer or cork cambium. A large part of the renewal bark is made up of cork cambium which, though devoid of lactiferous tissue, can influence the volume of latex flow appreciably by

providing a better support for the tapping knife and a deeper channel for the flow. A warning is given of the injurious effects of too frequent applications of palm oil through the accumulation of oxidized fat decomposition products on the bark surface. This damage can be avoided by the applications of oil to previously untouched areas of bark. There is a suggestion that oiled trees are in some cases liable to sunburn.

215. RUBBER RESEARCH INSTITUTE OF MALAYA. 633.912-1.556.8
The international notation for tapping systems. (Revised version, May, 1940.)
J. Rubb. Res. Inst. Malaya, 1940, 10 : 26-33. *Commun. R.R.I.M.* 247.

A revised version of the original recently accepted international notation for tapping systems.* The revised version has been formally approved by the Dutch East Indies Central Association of Experiment Stations, the Rubber Research Institute of Malaya and the Rubber Research Scheme (Ceylon).

216. GUEST, E. (RUBBER RESEARCH INSTITUTE OF MALAYA). 633.912-1.556.8
Amendments and additions to the international tapping notation.
J. Rubb. Res. Inst. Malaya, 1940, 10 : 16-25, bibl. 2. *Commun. R.R.I.M.* 246.

Certain amendments and additions have been incorporated in the revised version of the international tapping notation [see above]. These changes are enumerated and explained. Further possible amplifications of the notation are put forward. A revised scheme of classification shows how standard symbols can be used in abbreviated terms to designate general groups and classes of tapping.

217. KUNEMAN, J. H., AND DE JONG, W. H. 633.912-1.556.8
Hoog-tap bij rubber. (High tapping in rubber.)
Bergcultures, 1940, 14 : 1418-25, bibl. 10.

The question of high tapping of *Hevea* is thoroughly discussed from all aspects. As far as yield goes the experiments described in which single trees were both high and normally tapped gave 22-40% lower yield for high as against normal tapping. There was, however, an instance in which in a group of trees high tapping yielded more. This was probably due to some defect in the bark of the old tapping panels, but it is not possible to exclude the fact that some trees may yield more latex higher up than they do on the lower part of the trunk.

218. HEUBEL, G. A. 633.912-1.556.8-2.4
Tapvlakziekten en tapvlakziektenbehandeling van *Hevea braziliensis*. (Tapping back diseases and their treatment.)
Bergcultures, 1940, 14 : 1005-14, 1036-45, bibl. 24.

The diseases giving most trouble to the tapping panel of rubber in the Netherlands Indies are cankers caused by *Phytophthora palmivora* Fab. and *Pythium complectans* and mouldy rot by *Ceratostomella fimbriata* (*Sphaeronema fimbriatum*). Factors which may influence these diseases are discussed under the headings climate, tapping systems, depth of tapping, height of tapping cut above ground, the influence of ground cover, susceptibility of plant material, topography, spacing of trees, thickness of leaf canopy. Various remedies, chiefly of the nature of washes and sprays, are discussed at considerable length. Directions in which further research is desirable as regards both chemical and cultural methods of control are mentioned.

219. MULDER. 33.912-1.556.8-2.4
Tapvlakziekten en tapvlakziektenbehandeling van *Hevea Braziliensis*. (Tapping diseases.)
Bergcultures, 1940, 14 : 1368-72.

The writer takes exception to statements made in a previous article by Heubel and hopes to provoke an interesting discussion [see previous abstract].

* A standard international notation for systems of tapping hevea. *Ibidem*, 1939, 9 : 164-70 and *Commun. R.R.I.M.* 240; *H.A.*, 10 : 286.

220. LAL SINGH.

634.1/7 : 581.056

Climatology of the Punjab fruits.*Punjab Fruit J., annu. No. for 1940, 4 : 640-7.*

The author discusses the suitability of different parts of the Punjab for a number of popular fruits. Since the climate is very varied considerable choice is possible for the country as a whole, but the essential is to grow the right fruit in the right place. *Apples, pears, cherries and persimmons* require an altitude (in the Punjab) of 4,000-7,000 ft. Baldwin, Cox's Orange and Delicious do exceptionally well. Hailstorms are the danger at these altitudes. Japanese persimmons are doing well at 4,500 ft. and 1,000 ft. *Peaches, plums, apricots and almonds* do well in submontane tracts of 1,500-3,000 ft. Hot drying winds are liable to cause damage. *Mango* flourishes in certain hot lowland districts, but frosts in winter and drying winds in summer render its extensive cultivation difficult. As regards rainfall the mango is not exacting as to quantity, since it seems to grow as well in districts with 10 inches of rainfall as in those with 150 inches, but time of rainfall is important in that it must not, for successful fruit setting, occur during the flowering season. Wind causes fruit drop especially with varieties bearing large-sized fruits. *Loquat* likes a relatively cool climate at about 2,000 ft. A good water supply and protection from hot drying winds are necessary. *Citrus* dislikes both cold and extreme heat, otherwise it has a wide range. Susceptibility to frost appears to be in the following order:—sangtra, khatta and Malta oranges, pomelo, grapefruit, citron, mitha or sweet lime and kaghzi nimboo or sour lime. The sangtra orange prefers a cooler climate to the Malta orange and is less tolerant of heat and low humidity. *Grapes* will grow from the hot plains up to 6,000 ft., provided there is no excessive rainfall at flowering or when ripening. Excessive heat appears to cause the fruit skin to thicken. *Guava*, though an unimportant crop, can be found everywhere except at high altitudes. It is susceptible to frost injury at 28° F. Ample moisture and shelter from hot winds are essential. *Bananas* grow where the conditions are suitable but these sites are few. The fruit is inferior to imported fruit. The *pomegranate* is fairly widespread. The best fruit is produced where the climate is hot and humid during ripening. The fruit that grows nearly everywhere in the Punjab is ber or *jujube* (*Ziziphus*). It is very hardy and withstands extremes of heat and comparative cold. There is an organized attempt to topwork thousands of the wild ber trees all over the country to better varieties. *Dates*. Although dates grow over a large part of the province their success as a fruit tree depends on absence of rain during ripening. Hillawi is a very suitable variety as it can be marketed even when uncured. *Phalsa* (*Grewia asiatica*) is a hardy and drought-resisting plant which thrives and fruits well in almost any soil. If damaged by occasional frost it shoots again from the base. Since the juice is reported to have medicinal value and also makes an excellent summer beverage, it might prove a source of income for soils which will not grow other fruit trees or even ordinary crops. *Figs*. In the absence of irrigation the fig requires an annual rainfall of more than 25 inches. It grows well over most of the province but does not ripen well in the colder parts. It is not a popular fruit with the public. *Litchi* is an exacting fruit requiring a moist atmosphere, abundant moisture and freedom from frost. It grows well in protected spots. *Strawberries* reach perfection in the hills. In the submontane tracts the quality is not good.

221. MAHNGAR, B. S.

634.1/8-1.541

Progeny garden, Risalewala.*Punjab Fruit J., annu. No. for 1940, 4 : 635.*

A note is given on the recently established garden at Risalewala, Punjab, which is to serve as a source of budwood and graft scions for the propagation of the best varieties of fruits suitable to the country. Apart from imported commercial varieties many trees deriving from individual local varieties of outstanding merit have been included. In 2-5 years' time enough budwood should be available for nursery propagation on a large scale.

222. LAL SINGH.

634.1/7-2.11

Protecting fruit trees against sunburn, frost and wind storms.*Punjab Fruit J., annu. No. for 1940, 4 : 626.*

Trees can be protected against sunburn by keeping them low-headed, by proper pruning and training so that the branches are led to shade the trunk, by covering the trunks with straw, paper or gunny cloth and by whitewashing. Frost protective measures are not described.

Against wind windbreaks are indispensable and the following trees are suggested: (Scientific equivalents for vernacular names not being given) Sheesham, Mulberry, Eucalyptus, Simbal, Mango, Jaman or Jamoa and Ber or Jujube (*Ziziphus*).

223. GIBBERD, A. V. 634.1 2: 382 6
Development of the fruit export industry.
Paps 3rd W. Afr. agric. Conf., 1938, Vol. 1 (received 1940), *Nigeria Section*, pp. 411-25.

An account is given of the development since 1931 of the Nigerian fruit industry under the guiding hand of the Department of Agriculture. The local orange has an unsatisfactory outward appearance when exported, though its quality is excellent. It promises to be profitable as a source of raw juice. The quality of Nigerian pineapples for export is well established. The control for dry season wastage is under investigation, the causes having now been traced (*Ibidem*, pp. 37-45, *H.A.*, 10: 1508). The export trade in Nigeria is still in an experimental stage but the difficulties to be encountered and the trend of market requirements are now known and can be dealt with.

224. MCINTOSH, A. E. S., AND HANSCHALL, D. M. 634.39
Recent experiments with minor crops.
Barbados agric. J., 1940, 9: 13-31.

The experiments are concerned chiefly with the trials of imported varieties of all kinds of fruits and vegetables likely to be suitable to the country and the selection and propagating of any likely to be valuable. Useful local varieties are also picked out for propagation. A modification of the usual method of propagating the breadfruit is described. Root cuttings about a foot long are washed and the cut ends dipped in creosote. They are then placed in sharp sand in a form of solar propagator. A number of shoots develop, and, when these are 3 inches high, they are cut from the parent root with a heel of tissue of the latter. These cuttings are replaced in sand in a similar propagator until rooted. They are then potted in bamboo pots and kept in a frame until established. As many as 15 plants have been obtained from one root cutting by this method.

225. LAL SINGH, BAL SINGH BAJWA, AND KHAN, A. A. 634.441
Mangoes.
Punjab Fruit J., annu. No. for 1940, 4: 675-9.

The difficulty of securing propagating material of trees of outstanding merit in private ownership on account of superstition and the desire to retain the monopoly of a good thing is gradually being overcome chiefly by propaganda distributed in various ways. Again budding is nowhere commercially used in the Punjab and inarching, in more than one way, severely limits the possibilities of reproduction. Budding would alter the whole situation and experiments have been carried out which show that, provided certain precautions are taken in relation to condition and age of budwood and stock, time of year, etc., the method should be quite feasible in the Punjab. The laborious method of topworking old trees by inarching is described, but a method of topworking by budding is being sought. A malformation of the inflorescence is becoming common and causing loss. The reason is still unknown. As a check to the biennial bearing of mangoes a thinning of flowers and fruit in the on year has proved of benefit, the object being to cause the young shoots to start and complete their growth early. Shoots which have borne the previous season and therefore started growth late will not flower the next year. [A full account of these investigations on biennial bearing in mangoes appeared in *Indian Journal of Agricultural Science*, 1939, 9: 835-67, *H.A.* 10: 1205.]

226. ULVI, A. M. 634.441-1.541.5
Mango budding.
Indian Fmg., 1940, 1: 222-5.

The propagation of the mango by budding under Sind conditions is described. Temperatures go to extremes and rainfall is meagre but irrigation is available. The fruit destined to supply the seed for stocks should be left on the parent tree till the majority of fruit has ripened. The stones are extracted from the fruit, washed, set two feet apart in well-prepared nursery beds and watered every few days. Seeds germinate in 3 weeks and should be fit for budding, i.e. of

lead pencil thickness, in one year if properly looked after. There are four flushes a year and budding is usually done during the February-March and August-September flushes, these being the coolest seasons. Budding when the stock is not in full flush is useless. Budwood should not be selected from a branch in flush, the buds in the leaf axils should be prominent, about the size of a pin's head, and dormant. The bark should peel easily. The buds are taken from mature wood, usually from the second and third flushes from the ends of the branches. The budwood must be kept shaded and moist and used as soon as possible, a few hours' delay may result in failure. The leaves are removed but the petiole is left. [In some countries it is removed.—ED.*] The wood at the back of the bud is removed. A vertical incision is made in the stock bark, the edges loosened with the butt end of the budding knife and the stock bent forward to open the cut. The bud is at once inserted, forced up and bandaged tightly with moist plantain fibre. Budding height is one foot from the ground. The buds shoot after about a fortnight. As the bud swells the stock top is pruned back by degrees until a short stub remains above the bud which would now be in growth. Adventitious buds will appear in numbers on the stock stem and should be removed every two or three days. Protection from cold winter winds is given. Intense heat is not favourable but plenty of sunlight is necessary for growth. A year later the budlings, now 2 feet high, can be transplanted. Field grown seedlings can be budded in the field by this method on stem or limbs when 2 or 3 years old. Plants for transplanting are in Sind dug up with a ball of soil and stood in close rows under shade for some weeks. Each ball of soil is wrapped and tied in a gunny bag and while in the store the soil surface of the massed plants is covered with hay. This system is said to reduce transplanting failures to a minimum.

227. LAL SINGH, AND KHAN, A. A.

634.441

Forcing mango trees to bear regularly.

Indian Fmg, 1940, 1 : 380-3.

The biennial bearing habit of the mango and the causes thereof are discussed in the light of experiments conducted at Lyallpur, Punjab. The number of growth flushes and their times of starting vary with environment but Langra mangoes at Lyallpur have proved fairly constant in producing five flushes at regular monthly intervals between April and August. This variety was selected for observation, the trees being situated in the Mango and Date Avenue of the Punjab Agricultural College, Lyallpur. About 1,300 shoots were studied over seven years in relation to (a) relative importance of various flushes growing in different months of the year in regard to their fruiting in the following year; (b) the seasonal growth of fruits which fruited or did not fruit in the following year; (c) the growth performance and fruiting records of the same shoots from year to year; (d) the effect of deblossoming on the growth and fruiting of deblossomed shoots. (a) The April and May flushes were more fruitful than the later ones. (b) Those shoots of any flush which completed their growth first were the ones to fruit the following year. Those which prolonged their growth did not fruit. The reasons for this fruitfulness seem to be the early production of an abundant leaf area and a longer period in which to ripen the wood. (c) Fruiting shoots did not grow or only to a very small extent and failed to fruit again next year. Flowering shoots seldom flowered the second season. Only those shoots flowered which had stopped growth early the previous season. Flowering only occurred on shoots one season old, thus there was a direct relationship between the number of shoots growing in a season and the number fruiting in the next. The reason for all the trees in a given mango tract cropping and failing to crop more or less unanimously, though of different ages, is initiated by some external calamity such as frost, pests or diseases which throw the trees out of balance and into a cycle of alternate bearing. Excessive fruiting will also start a biennial bearing cycle. Of shoots which were artificially deblossomed in early spring, 70% fruited the following year, those on which the fruit was allowed to develop did not do so.

228. ANON.

634.57

Planting the Queensland nut.

Qd agric. J., 1940, 54 : 60-1.

Practical notes on planting *Macadamia ternifolia*, the Queensland nut, under Queensland conditions. Preliminary deep ploughing is advised with subsoiling if possible. The planting

* See Vegetative propagation of tropical and sub-tropical fruits. *Tech. Commun. Bur. Hort., East Malling*, 7, 1936. 2s.

hole should be 2 feet across and 18 inches in depth. When lifting the plant in the nursery a good length of taproot should be taken. The soil should be watered the day before lifting. The soil may be loosened for easier extraction of the plants by making a trench 18 inches deep alongside the rows. Watering and shading after planting are necessary. Pruning should aim at producing a sturdy well-balanced tree and for this reason the main stem must not be allowed to get too lanky before topping; the correct height for topping is 2 feet. Three side shoots are subsequently selected to form the framework. When the trees fail to produce a single stem the strongest and best situated must be chosen. Staking is necessary and later probably some branch thinning.

229. KINCAID, J. L. B.

634.6

Oil palm experiments at Benin Agricultural Station.

Paps 3rd W. Afr. agric. Conf., 1938, Vol. 1 (received 1940), *Nigeria Section*, pp. 355-7.

A few notes are given of the investigations in progress. The palms are hard-shell type from wild parents. Spacing for yield trials is 25 ft. square or 65 trees per acre. Percentages of oil to fruit is about 10·8%. The spacing experiment, i.e. effect of different spacings on individual yield does not, after 11 years, convey very much. The effect of flower pruning was a great reduction in yield on the part of the treated palms over the last two years and little difference in the first year. The results are contrary to expectation. After 3 years no one important factor in the care of mature palms could be found. The treatments consisted of cleaning, ringweeding and removing dead leaves. Ground rock phosphate applied at the rate of 5 cwt. per acre on alternate rows of palms was ineffective after 3 years, the yields of the treated palm being in fact insignificantly lower. It was immaterial whether food crops or cover crops were interplanted with young palms. After 6 years the shading effect prevents the cultivation of food crops.

230. SALGADO, M. L. M.

634.61-1.87

Coconut poonac as manure.

Trop. Agriculturist, 1940, 95: 3-7, bibl. 5.

The output of coconut poonac in Ceylon is theoretically only sufficient for the livestock population of the island. Difficulties of economics and distribution cause local surplus and in such cases the use of poonac as manure may be considered. There are several grades of poonac and their composition is here tabulated. Sediment poonac may contain up to 7% nitrogen while the other grades, except chekku poonac which has less, contain about 3%. Sediment poonac, in spite of its high oil content (about 20%) has a narrow C/N ratio (8·46) and could be considered a manure as good as groundnut cake. The oil itself is unlikely to have any deleterious effect on the soil for recent work has shown that, contrary to general belief, fats are readily oxidized in tropical soils and provide considerable energy for nitrogen fixation. Poonac also contains about 3% potash and 1·5% phosphoric acid. The relative values of poonac and imported manures are compared. When manure firms are unable to supply the full requirements of nitrogen in inorganic form 50% of the nitrogen is replaced by groundnut cake. It is calculated that it would not be uneconomic to use coconut poonac instead of groundnut cake in coconut manure mixtures and that provided there are no technical objections its use as manure may be encouraged.

231. UMALI, D. L.

634.61-1.521

A study on coconut seed selection for germination.

Philipp. Agric., 1940, 29: 296-312, bibl. 5.

Germination in this paper means the resumption of growth by the embryo in a seed nut from the time of planting to the time it becomes visible outside the covering husk. The nuts used were the Laguna type taken from 17-year-old trees at the Philippine College of Agriculture Experiment Station. The mature bunches were carefully lowered to the ground. Nuts which fell or did not contain water were discarded. Thin-husked nuts (average 2·9 cm. thickness of husk) germinated earlier and produced more leaves and roots than thick-husked nuts (3·0 cm. and over). Nuts from a setting percentage of 35·5 per bunch and over, nuts from heavy bunches of 10 or more and nuts from bunches with a high percentage of female rachis (50·5 or

more) all germinated earlier and produced better plants. Light nuts (0.91-1.35 kg.) germinated later than heavy nuts (1.85-2.45 kg.) and produced shorter seedlings with less roots and leaves. Ventral or dorsal position of nuts on the bunch did not influence time and percentage of germination, but seedlings from the dorsal side produced more leaves and were the heavier while seedlings from the ventral side were taller and had a better root system. Seedlings from the top nuts produced more leaves and roots than those from the bottom. The middle nuts germinated earlier but gave a much lower percentage of germination than either top or bottom.

232. TAMMES, P. M. L. 634.61 : 581.145
 Over de ontwikkeling van de vrucht van den klapper en de factoren, welke van invloed zijn op de hoeveelheid copra per noot. (**On the development of the coconut and the factors influencing the copra content of the nut.**) [English summary 4 lines.]
Landbouw, 1940, **16** : 385-95, bibl. 12, and *Bergcultures*, 1940, **14** : 1101-7, bibl. 12.

The development of the fruit of the coconut is described. The following factors affect its development. *Drought* delays development, reducing the growth of young nuts. The older leaves often die off too early and with them the young trusses. The nuts drop and mature too soon with the result that they are deficient in copra. When it requires more than 500 nuts to provide 100 kg. of dried copra, it is an indication that there has been insufficient moisture. *Rainfall*. Little is known of the influence of excessive rainfall and it is not certain whether the occasional bursting of young nuts has any connexion with it. As a general rule the only situations in which heavy rainfall is not beneficial is when the trees are growing on swampy ground or on soils deficient in minerals. On such ground the trees do better in the dry season. *Soil* conditions of an unfavourable nature produce such symptoms as low yields, untimely dying off of older leaves and their flower trusses, shrivelled copra, yellowish leaves and in the worse cases a thinning of the stem and the death of the tree. *Pests and diseases*. Various fungus disease and insect pests reduce the copra yield either by killing off the leaves and causing premature nut fall or by their attacks so injuring the internal economy of the tree that the young nuts fail to make copra. *Harvest*. From the point of view of economy in labour the intervals between pickings should be as long as possible. The time varies with the country from 2 months to 1 month. Nuts picked too soon have less copra, those left too long on the tree may start to germinate.

233. O'CONNOR, B. A. 632.76 : 634.61
Notes on the coconut leaf hispa, *Brontispa froggatti* Sharp, and its parasites.
New Guinea agric. Gaz., 1940, **6** : 2 : 36-40, bibl. 3.

Information gained in the breeding and distribution of *Tetrastichodes brontispa* Ferr., a *Eulophid* parasite of the larvae and pupae of the coconut beetle, *Brontispa froggatti*, and an account of the methods of rearing both beetle and parasite in captivity are given.

234. O'CONNOR, B. A. 632.76 : 634.61
The coconut leaf miner, *Promecotheca papuana* Csiki., and its parasites.
New Guinea agric. Gaz., 1940, **6** : 2 : 20-30, bibl. 4.

The bionomics of the coconut leaf miner, *Promecotheca papuana* Csiki., are described and some account is given of a number of parasites and predators. Normally the beetle seems to be controlled by native parasites but occasional outbreaks occur. In a severe infestation the leaflets are completely destroyed, turning a greyish brown colour, the palms appear as if scorched and, if the central shoot is much damaged, they may die.

235. CHILD, R. 634.61 : 613.2
The food value of the coconut.
New Guinea agric. Gaz., 1940, **6** : 3 : 33-6. Reprinted from *Young Ceylon*, July-August 1939.

The food value of the following products of the coconut are briefly discussed :—Coconut kernel, copra, poonac, desiccated coconut, coconut flour, parings, coconut oil, coconut protein, carbohydrates, coconut milk, mineral salts, vitamins, toddy.

236. FROGGATT, J. L., AND O'CONNOR, B. A.

634.61-2.7

Insects associated with the coconut palm.*New Guinea agric. Gaz.*, 1940, 6 : 3 : 16-32, bibl. 4.

This is the first of a series of articles in which it is hoped to deal with all insects found in direct association with the coconut palm in New Guinea. A list of these insects is given. In the current paper the coconut tree hoppers *Sexava* spp. are dealt with. A very complete life history is given. *Control measures.* A number of parasites have been recorded, either indigenous or in neighbouring countries. Two of these, *Doirania leefmansii* Waterst. and *Leefmansia bicolor* Waterst., are regarded as promising and are being bred and liberated. Mechanical control may be obtained to some extent by collecting adults and nymphs by means of the old palm fronds, heaping the fronds along the rows of palms in an infested area and lighting them from the outside rows inwards. The heat will cause the hoppers to fall to the ground. Other methods are the systematic collection of eggs and hoeing or ploughing to bury the eggs and so prevent large numbers of nymphs from reaching the surface, while unexposed unbred eggs are eaten by birds, lizards, etc. Arsenical dusts, especially calcium arsenate, gave high mortality but the results of derris were irregular. Two rows of palms could be satisfactorily dusted together.

237. LAL SINGH AND BAL SINGH BAJWA.

634.62

Dates.*Punjab Fruit J., annu. No. for 1940, 4 : 680-5.*

Propagation. Results of experiments with dates in the Punjab have shown that certain local ideas with regard to propagation are too narrow. (a) Small and medium suckers are just as successful in taking root as are the very heavy ones commonly used. (b) The smaller suckers are more successful planted in spring than in autumn, the large and medium ones are indifferent as to season. *Curing.* Experiments were carried out to ascertain whether the present expensive and lengthy method of curing high quality dates could be changed with advantage. The dates used were in the *dung* stage, the usual time of picking (i.e. when the tip of the date is a translucent brown) and the *doka* stage (2 or 3 days before the *dung* stage). If the *doka* stage could be successfully cured it would eliminate the need of picking the *dung* stage by single fruits. (a) Satisfactory results were obtained by dipping in 1% boiling lye solution for 1 minute. (b) Lye-dipped *dokas* cured more uniformly, acquired a better lustre and deeper colour and were less sticky than untreated *dokas*. (c) Dipped *dung* was also improved in appearance though less noticeably. (d) Undipped fruits were slightly sweeter than dipped ones. (e) The time of curing was reduced from 5 days to 3 days and less. Dates cured in a drying box at temperatures ranging from 120° to 130° F. confirmed the results given above. They proved better than sun-cured dates; the range of temperature 125°-130° F. was the most satisfactory. In order to preserve the dates from dirt and insect attack a solar curing room is to be constructed in which it is hoped to maintain optimum temperature and humidity. Consumption of dates in India could be greatly increased but even now there is no danger of over-production since large quantities are imported annually. The limiting factor is the small number of suckers available for propagation, and importation is complicated by the war and the fact that many date growing countries now prohibit export of suckers.

238. AMOLAK RAM.

634.662

Ber (*Ziziphus Jujuba*).*Punjab Fruit J., annu. No. for 1940, 4 : 690-1.*

Ziziphus Jujuba succeeds in many places in the Punjab even on poor and alkaline soil which will not carry other fruits. The Experiment Garden, Lyallpur, has a good collection of varieties from which to propagate. Two of the best are described.

239. LAL SINGH AND SHAM SINGH.

634.668

The phalsa (*Grewia asiatica*).*Punjab Fruit J., annu. No. for 1940, 4 : 686-7.*

The phalsa is an accommodating tree which can grow well with but little manure and irrigation, while the annual severe pruning given to cultivated plants keeps it fairly free from disease. The juice of the fruits produces a cooling drink and its cultivation near towns should be profitable in the Punjab. In pruning experiments bushes cut back 3½-4 feet always gave higher yields

than plants more heavily pruned. Unpruned plants grow so tall that gathering the fruit becomes unnecessarily expensive. Pruning and spacing experiments continue.

240. CROUCHER, H. H., AND MITCHELL, W. K. 634.771-1.8

Fertilizer investigations with the Gros Michel banana.

Bull. Dep. Sci. Agric., Jamaica 19, 1940, pp. 30, bibl. 6.

The paper discusses 6 experiments in the manuring of Gros Michel banana which the Department of Agriculture and the United Fruit Company have been conducting in various banana district of Jamaica from 1936. The method of application of manures followed and recommended was to broadcast the manure in a circle on the ground close around the stool, since the feeding roots appear to be confined to the top 18 inches. The maximum diameter of this circle reached 4 feet when the plant was full grown. Greater concentrations were applied near the follower. On steep hillsides the manure is applied in a semi-circle above the plant or in a series of shallow holes made with a crowbar. The initial dressing up to 1 lb. in weight may be placed in the hole at planting time and no ill effect has been observed on sucker germination. Reactions to fertilizers were obtained in all experiments and the type of reaction was related to the nutrient status of the soil assessed by chemical methods. Recommendations based on this status are given for manurial programmes. Grade was only moderately affected by manures but the factors determining quality, the number of fingers per hand and length of finger are improved. Stimulation of rapid growth resulted in better fruit and in a given time a larger number of stems than was provided by plants growing more slowly. An unbalanced manure containing excess phosphate produced short-fingered fruit and distorted fingers. The effects were counteracted by the application of additional potash. Early application of nitrogenous fertilizers prevents nitrogen shortage in the immediate vicinity of the decomposing planting material and enables the plant to resist banana weevil borer. The result is a reduction of the number of supplies required. The United Fruit Company on irrigated alluvial lands had shown that a monthly application of nitrogen gave the best results. On the sedentary hillside soils, mostly clay in texture and often eroded, the Department of Agriculture found that the half-yearly application of phosphatic and potassic manures met theoretical requirements.* Tables based on chemical determinations and the reactions obtained from fertilizers are given showing tentative relationship between the nutrient status of the soil and the reaction to N, P and K application.

241. GRAY, L. V. 634.771-1.542

Mattocking bananas.

J. Jamaica agric. Soc., 1940, 44 : 258.

When the banana bunch is picked and the old trunk cut down a portion of this trunk is often allowed to remain on the root, presumably to support the follower. Actually this old head continues to use up nutrient required by the follower, gives off in consequence a large number of unwanted water suckers and prevents the follower from feeding in a complete circle, thus retarding its growth. It also forms a breeding place for borer. The proper treatment is to remove the entire old tree at the root and to chop it up so that the pieces may dry quickly and thus kill any borers within, to fill in the hole so left with good soil and to fork, and possibly manure, to a radius of 4 feet from the new sucker. This will also improve the grade of the succeeding crop of ratoon bananas and the ratoons will have a better hold on the ground and be more resistant to drought and hurricane. The cost should not exceed a penny a root.

242. HARRIS, P. L., AND POLAND, G. L. 634.771 : 577.16

Variations in ascorbic acid content of bananas.

Food Res., 1939, 4 : 317-27, bibl. 23.

Gros Michel bananas from different tropical sources contained approximately the same quantities of vitamin C, namely .100 to .110 mg. per gramme. Green bananas contained about .053 mg., which increased with ripening to the maximum of .110 mg. at the stage when the banana is usually eaten, i.e. peel yellow and flecked with brown, and then decreased rapidly to .032 mg. in the overripe state. Cooking, except in the peel, and processing resulted in considerably lessened vitamin C content.

* More definite recommendations for the various soil types will be found in *H.A.* 10 : 1209, where a summary of this paper from *J. Jamaica Agric. Soc.*, 1940, 44 : 138-42 was abstracted.

243. **MAGEE, C. J. P.** 634.771-2.8
Transmission studies on the banana bunchy-top virus.
J. Aust. Inst. agric. Sci., 1940, 6: 109-10, bibl. 3.

Bunchy top virus disease of bananas is transmitted only by the aphid *Pentalonia nigronervosa* and is destructive only to *Musa*. The virus cannot be transmitted by the aphid to susceptible plants under less than 1½-2 hours feeding. It cannot be transmitted by adults to their viviparous progeny. For nymphs, in which stage the aphid is most infective, to acquire the virus, they must feed on infected material for a minimum of 17 hours, an unusually long period. Temperature of 10-15° C. reduces the number of successful inoculations, and this may account for the lower winter incidence of the disease. The virus can be carried through the nymphal moults. There is a delay of a few hours to 2 days between the feeding on infective material and the development of infective power. Infected plants only carry the virus in the first symptom leaf and in those which develop later.

244. **EASTWOOD, H. W.** 632.11 : 634.771 + 634.774
Covers for pineapples and bananas.
Agric. Gaz. N.S.W., 1940, 51: 279, 288.

The use of paper is discussed as a substitute for the hessian bags, now difficult to obtain, used in covering growing bananas, and for the grass or bracken, unsatisfactory in many ways, used to cover pineapple fruit against chilling and sunburning. Heavy quality brown paper tubes give promising results with bananas. They are cheaper than hessian but unlike the latter can only be used for one season. The bags should be large enough to take the bunch without risk of the fruit tips later puncturing the paper. Disadvantages of paper are the possibility of it clinging to the bunch when wet or tearing in a high wind with a resultant sunburning of the fruit. The bags are made in 3 sizes, 33" × 26", 30" × 29", and 30" × 24". The edges of the tube must be sewn, not gummed. Pineapples are bagged with ordinary brown paper bags with a capacity of 12 lb. as used in shops. They are pushed over the top of the plant and remain in position. The colour will fade but without detriment to the fruit. About half of them will be serviceable for a second season.

245. **CLARK, H. E.** 634.774 : 581.192
Oxalates in pineapples.
Food Res., 1939, 4: 75-9, bibl. 7.

Experiments with the Cayenne pineapple indicate that ripe Cayenne pineapples certainly contain less than .01% and probably less than .005% oxalic acid as oxalates in any form. Such a low concentration can have no physiological importance in human nutrition.

246. **PLANK, H. K., AND SMITH, M. R.** 634.774-2.752
A survey of the pineapple mealybug in Puerto Rico and preliminary studies for its control.
J. Agric. Univ. Puerto Rico, 1940, 24: 49-76, bibl. 11.

The attacks of pineapple mealybug (*Pseudococcus brevipes* Ckll.) are believed to have decreased returns and caused the reduction or abandonment of some formerly high-producing areas. The bionomics of the pest are discussed. Attempts to clean planting stock of mealybug by submersion of pineapple slips in water for 96 hours resulted in a 99.13% kill of mealybug and a 50% kill of slips. Submersion for 72 hours produced 92.04% control for a loss of 15.5% of slips, and among the survivors an average of 5 mealybugs were found on each infested slip. A 97.93% kill was obtained by holding the slips in a closed room with moisture saturated air at about 115° F. (46° C.) for 6 hours; 10.5% of the slips still contained living mealybugs but the number averaged only 1 mealybug per slip. No planting stock was lost and the treatment seemed to stimulate later growth. Precautions suggested are the avoidance of sod land for new fields, removal of mealybug host plants, especially old pineapple stumps, cover-cropping before replanting old fields, destruction of ant colonies, use of mealybug-free seed or planting skips and clean cultivation of the pineapple crops.

247. ROSEDALE, J. L., AND MILSUM, J. N. 635.1/7
Malay leaf and other vegetables and their analyses.
(Bull.) Dep. agric. S.S. & F.M.S. gen Ser. 31, 1940, pp. 21, bibl. 10, 50 cents.
 Identifications and descriptive notes and analyses of 62 vegetables found in Malaya. The majority are either wild or found growing with the minimum of cultivation in the vicinity of dwellings. The publication draws attention to an important aspect of food production in Malaya and provides data for further investigation on the subject.
248. DRAVID, R. K. 581.036
Studies on soil temperatures in relation to other factors controlling the disposal of solar radiation.
India J. agric. Sci., 1940, 10 : 352-87, bibl. 7.
 ACHARYA, C. N. 631.875
The hot fermentation process for composting town refuse and other waste material.* III. The hot fermentation vs. aerobic systems of composting.
Indian J. agric. Sci., 1940, 10 : 448-72, bibl. 9.
 JULIANO, J. B. 632.51
Viability of some Philippine weed seeds.
Philipp. J. Agric., 1940, 29 : 313-26, bibl. 24.
 SPOON, W. 632.951.1 : 615.778/9
Kwaliteitsomschrijving van derrispoeder. (Evaluation of derris powders.)
Landbouw, 1940, 16 : 367-71.
 DIJKSTRA, A. 633.491
De aardappelcultuur in Midden-Java. (Potato-growing in Central Java.)
Landbouw, 1940, 16 : 471-89.
 STEVENSON, G. C. 633.61
Sugar-cane varieties in Mauritius. An historical review, with particular reference to present breeding problems.
Emp. J. exp. Agric., 1940, 8 : 301-10.
 VAGHOLKAR, B. P., APTE, V. N., AND IYER, S. S. 633.61
A study of plot size and shape technique for field experiments on sugar cane.
Indian J. agric. Sci., 1940, 10 : 388-403, bibl. 3.
 CROUCHER, H. H. 633.61
A survey of the yields of sugar cane in Jamaica 1937-1938.
Bull. Dep. Sci. Agric., Jamaica, 24, 1940, pp. 29.
 INNES, R. F. 633.61
A survey of the yields of sugar cane in Jamaica 1938-1939.
Bull. Dep. Sci. Agric., Jamaica 23, 1940, pp. 39.
 DEIJS, W. B. 633.72 : 581.192
Over het chemische van de fermentatie van thee. I and II. De fermenten in theeblad. (Chemistry of fermentation in tea I and II. In the leaf.)
 [English summary I p.]
Arch. Theecult. Ned.-Indië, 1940, 14 : 26-42, bibl. 8, 14 : 82-90, bibl. 7.
 SLOTEMAKER, A. C. 633.72-2.19
Verflenzen ; bladtemperatuur. (The withering process (of tea) and leaf temperature.)
Bergcultures, 1940, 14 : 1220-2.
 DEB, S. B., AND ROBERTS, E. A. H. 633.72-1.57
The respiration and anaerobic fermentation of tea leaf and their relationship to tea fermentation.
Biochem. J., 1940, 34 : 1507-16, bibl. 19.
 BARUA, D. N., AND ROBERTS, E. A. H. 633.72-1.57
Methods for the volumetric estimation of tea tannin in green-leaf and black tea. A new alkaline permanganate method.
Biochem. J., 1940, 34 : 1524-31, bibl. 8.

* Parts I and II, *Ibidem*, 9 : 741-4 and 817-33, noted only, *H.A.*, 10 : 921.

- SWAMY, R. L. N. 633.73-1.523
Genetical studies in *Coffea arabica* L. A preliminary study with young leaf colour and ripe pericarp colour.
Indian J. agric. Sci., 1940, 10 : 414-21, bibl. 8.
- FRAHM-LELIVELD, J. A. 633.73-2.19
 Ontstaan en voorkomen van rondboon en voosboon bij koffie. (**Origin and prevention of round bean and spongy bean in coffee.**)
Bergcultures, 1940, 14 : 1358-62, bibl. 5.
- VAN DE VECHT, J. 633.841-2.76
 De kleine pepersnuitkever (*Lophobaris piperis* Marsh). (**The lesser pepper weevil.**) [English summary 2 p.]
Landbouw, 1940, 16 : 323-66, bibl. 20.
- SHARP, C. C. T. 633.912-1.523
Progress of breeding investigations with *Hevea brasiliensis*. The Pilmoor crosses 1928-1931 series.
J. Rubb. Res. Inst. Malaya, 1940, 10 : 34-66, bibl. 4, being *Commun. R.R.I.M.* 248.
- RAHMAN, K. A. 634.1/7-2.7
Important insect pests of fruit trees in the Punjab and their control.
Punjab Fruit J., annu. No. for 1940, 4 : 715-21.
- KOHLI, K. L. 634 : 334
The story of the development of the Punjab Provincial Co-operative Fruit Development Board.
Punjab Fruit J., annu. No. for 1940, 4 : 728-32.
- BAIN, F. M. 634.61-2.19
Report on the coconut growing areas of Jamaica.
Bull. Dep. Sci. Agric., Jamaica 22, 1940, pp. 12.
 Reprinted, see *H.A.*, 10 : 710.
- MENDIOLA, N. B., AND MERCADO, T. 634.771
Introduction and trial culture of Ambon bananas in the College of Agriculture.
Philipp. Agric., 1940, 29 : 415-30, bibl. 13.
- SCOTT, L. B. 632.78 : 635.65
The bean pod borers of Puerto Rico.
J. Agric. Univ. Puerto Rico, 1940, 24 : 35-47, bibl. 3.

STORAGE.

249. COLONIAL OFFICE, LONDON. 664.8
The storage of foodstuffs in the Colonial Empire.
Bull. imp. Inst., 1940, 38 : 163-80, bibl. 10.
250. D.S.I.R., NEW ZEALAND. 664.85.037
Annual report on fruit cold storage 1939-40.
Orchard N.Z., 1940, 13 : 164-5.

Refrigerated gas storage investigations with Jonathans showed the most suitable temperature to be 42° F. in an atmosphere of 9% dioxide and 12% oxygen—stored in the hard green stage. Gas stored fruit had no Jonathan spot. Air stored controls had a considerable amount. Similar atmospheres and temperatures were best for Sturmers also. In general superficial scald was eliminated in storage atmospheres containing more than 3% CO₂. Fungus wastage was retarded at this concentration and suppressed, almost entirely at 9% CO₂. Effect of fertilizers on storage was not always clear but the following results were obtained. *Dunn's Favourite*. 4 lb. ammonium sulphate per tree in addition to normal dressing of P and K induced a marked increase in breakdown. *Jonathan*. N and K slightly increased susceptibility to breakdown. *Sturmer*. Fruit from trees receiving N only was subject to breakdown but resistant to wilt.

P induced wilt but reduced breakdown. The skin mottling to which Sturmers are liable was increased by N and K and reduced by P. The effect of boron soil dressings on Jonathan noted last year seems to be that fruit from trees treated 3 years ago with a dressing of 3 lb. of borax per tree is still more subject to breakdown. It is suggested that when boron content of the fruit rises above 30 p.p.m. the storage quality of the fruit suffers. The storage quality of Cox's Orange, Jonathan and Sturmer was not affected by two applications of both 0.1 and 0.25% borax sprays, though the boron content of the fruit was markedly increased. Experiments with Granny Smith in relation to superficial scald were mainly inconclusive owing to the low incidence of scald even in the control sample. At 31° F. Jonathan was found to be very susceptible to deep scald. No differences resulted between Winter Cole pears placed loose in open cases for precooling before packing for shipment and pears packed as for shipping before precooling. With a final holding temperature of 31° F. the unpacked fruit required about 72 hours to fall to 36° F., whereas the packed fruit required 108 hours to fall to 34°. In conclusion there are notes on wastage in citrus fruits and proposals for a future experimental programme.

251.

ANON.

664.85.037

Cold storage in the Punjab.

Indian Fmg., 1940, 1 : 235-6.

In a brief note on the behaviour of fruits in cold storage at Lyallpur Research Station is mentioned that of mangoes picked in the hard green, firm yellow, and full ripe stages respectively. Picked in the hard green or firm yellow stages mangoes stored well at 45° F. for 5 weeks and 4 weeks respectively. Wrapping mangoes in tissue paper reduced wastage as well as loss in weight and appearance. Dipping in 5% borax solution reduced wastage slightly. Bartlett pears in 4 stages of maturity, i.e. (A) yellowish green, firm, crisp, sweet, astringent, acid; (B) more advanced than (A), greenish yellow, still crisp, less astringent, firm; (C) green, mature, hard, crisp and astringent; (D) fully ripe, yellow, creamy, and sweet; were tested in store. (A) ripened normally in 25 days and (B) in 20 days at 40° F. and remained in good condition for a week after. At 36° F. (A) took 6 weeks and (B) 4 weeks. (C) at 36° F. behaved as (A) except that the change was slow. (D) stage at 36° F. turned brown after 18 days. (A) and (B) stages at 32° F. kept for 5½ and 4½ months respectively. The effect of borax on keeping quality was bad, except at 36° F., in the case of wrapped fruit. Wrapping reduced loss of weight but increased wastage. The seedless Quetta grape (Kishmish) stored best for 20 days at 32° F.; 25% could be kept in excellent condition for about 6 weeks by carefully removing brown and diseased berries. Borax treatment was harmful. Packing was beneficial at 32° F. and 40° F. Loss in weight was highest at 40° F. and least at 32° F.

252.

TINDALE, G.

664.85.11.035.1

The gas storage of apples.

Fruit World, Melbourne, 1940, 41 : 7 : 7-9!

The following notes on the behaviour of certain apple varieties in gas storage in Victoria are taken from an address delivered at a meeting of the Australian Institute of Refrigeration on the principles of gas storage, with special reference to local conditions. Granny Smith and Stewart kept better in 5% CO₂ (under the system of controlled ventilation) than in air and better in 10% CO₂ than in 5% CO₂. These gas-stored apples emerged greener, harder, and possessed of a flavour nearer to that of fresh apples than the air-stored controls. The storage life of Granny Smith and Stewart in air at 32° F. was 6 months, in 5% CO₂ 7 months, and in 10% CO₂ 8 months. Cleopatra, another apple picked green, showed retardation in colour change at 5% and 10% CO₂ but otherwise as regards softening and deterioration of flavour did not differ from the controls. London Pippin, also normally picked green, was not benefited by gas storage; on the contrary at 10% CO₂ 65% developed severe brown core and at 5% CO₂ 10% developed it. Of other varieties usually picked at a much later stage of maturity, Rome Beauty, Delicious and Yates stored as well in air as in either concentration of CO₂. Democrat in 10% CO₂ was slightly better and in 5% CO₂ no better than when stored in air at 32° F. However, 25% of those in 10% CO₂ developed slight core-browning. King Cole developed 80% of core-browning at 10% CO₂ and a trace at 5% CO₂ and the unaffected apples were no better in quality than those stored in air. In Jonathan the disorder Jonathan spot was completely controlled in gas storage; storage at

10% CO₂ caused much breakdown, at 5% CO₂ the breakdown was reduced to that of the air-stored controls. As regards storage temperatures all the apples mentioned except Jonathan and King Cole can withstand continuous air storage at 32° F. These two must be stored initially at 36° F. until the end of April (in Australia), at 34° during May and at 32° thereafter. The same relationship holds good for gas storage.

253. ISAAC, W. E. 664.85.11.038
Storage tests with Granny Smith apples with special reference to superficial scald (1938 season).
Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 78-87, bibl. 4.

The most important conclusion drawn from the tests here described is that the amount of superficial scald developing in Granny Smith apples is greatly affected by storage temperature, the higher the temperature the less the incidence of superficial scald, the temperatures used being 31°, 34° and 37° F. This applied whether the apples were wrapped or not. The method of controlling superficial scald by wrapping with oil-soaked papers considerably reduced the number of scalded apples during a 6-month storage period at 34° F. and 37° F., but at 31° F. there was a marked decrease in their effectiveness at the end of 4 months and even more so at the end of 5 months' storage. Three weeks delay in storing did not result in an appreciable control of the disorder.

254. CHITTENDEN, E., AND THOMSON, R. H. K. 634.11 : 546.27 : 664.85.11
The effect of borax on the storage quality of Jonathan apples.
 Reprinted from *N.Z. J. Sci. Tech.*, 1940, 21 : 352A-6A as *Cawthron Inst. Publ.*
 44, bibl. 2.

The effect of excessive borax top-dressing at the rate of 3 lb. per tree in the previous season was not so marked as in the year of application but even so amounted to a serious increase in the incidence of internal breakdown in Jonathan apples. No harmful effects on storage quality followed the application of 0.1%, 0.15% and 0.25% borax sprays given in combination with the usual spray mixtures.

255. KLINKENBERG, C. H. 634.11-2.19
 Anatomisch onderzoek van de zgn. "kurkvlekken" in het vruchtvliesch van appels. (**Anatomical investigations of cork in apples.**)
Tijdschr. PlZiekt., 1940, 46 : 87-94, bibl. 13.

The author reviews the literature on cork spot* in apples and describes her own work, from which she infers that most of the so-called cork spots found in the flesh of apples do not arise from cells of which the walls contain corky material, assuming that by cork is meant a material which reacts with the stain Soedan IV (Scarlet Red), a chlorophyll dissolvent, and other reagents mentioned, but that they are simple necrotic areas. The use of the terms cork spot and internal cork should be discontinued.

256. HUELIN, F. E. 664.85.13.035.1
Refrigerated gas storage of pears.
Fruit World, Melbourne, 1940, 41 : 9-10.

The following notes on the behaviour of certain pears in gas storage in Australia are taken from an address delivered at a meeting of the Australian Institute of Refrigeration. Six varieties of pear are dealt with. The CO₂ concentrations were 5% CO₂ and 10% CO₂ maintained by the system of controlled ventilation. The storage life of a pear is taken to mean the longest period over which a green and hard but full-grown pear may be stored without losing its power to ripen normally with full juice and flavour on removal to a temperature of 65° F. Williams Bon Chrétien and Beurré Bosc have a storage life of 3 months in air at 32° F. which can be increased to 6 months in 10% CO₂. However, the high quality varieties Packham, Winter Cole, Josephine and Winter Nelis will keep in air storage for 6 months with an extension to 9 months in 10% CO₂, so that there is little use in storing Williams and Bosc to compete with them. Gas storage of Williams is valuable in that it enables the canning season to be spread over a longer period in

* For review of literature on bitter pit up to 1934 see *Occ. Pap., Bur. Hort., East Malling*, 3, 1934. 1s. 6d.

districts where large quantities of Williams have to be picked in about a fortnight. It is necessary to gas-store the pears fairly soon after picking. Both Williams and Bosc have been injured by preliminary storage at 32° F. for 6 weeks before being placed in gas storage at 10% CO₂. These results have a practical application on shipboard where an accidental excess accumulation of CO₂ in the hold may cause injury to pears previously only cold-stored.

257. VAN DER PLANK, J. E., AND VAN WYK, G. F. 664.85.13.035.1
Delayed storage and treatment with acetylene as aids to the ripening of Bon Chrétien pears at 45° F.
Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 9-25, bibl. 3.

A consistent feature of the results both with delayed storage and acetylene treatment was that satisfactory ripening at 45° was obtained only when the fruit was about to soften or had appreciably softened at the time of cooling. Fruit cooled immediately or at any time during the initial period of maintained hardness failed to reach a high standard of palatability at 45°. These confirm data from the previous year. The aim, then, is to break this initial period of inactivity in some easy way. The difficulty with delayed storage is its inconsistency. In some cases a delay of a few days sufficed, in others it was quite inadequate. Acetylene reduced the period between picking and softening in a most uniform manner, treatment for 2 or 3 days sufficing. There appear, however, to be great difficulties in the way of applying acetylene particularly with regard to temperature. The best quality in Williams pears is got by ripening at a relatively cool temperature, i.e. 60-70° F., but at harvest time the pack houses are usually 20° F. higher while self-heating under the influence of acetylene would raise the temperature still more. It is suggested that failure to ripen properly at low temperatures is associated with areas (in different parts of the world) where the period between picking and softening is a long one and where cooling is carried out while the fruit is still inactive. Williams pears found to ripen easily at 45° F. are, it is suggested, active at the time of cooling and will be found in regions where prompt cooling is necessary to avoid too much softening. Further it is suggested that differences between competitive supplies in ability to ripen under winter warehouse conditions is not due to inherent differences in resistance to cold or in the range of ripening temperatures, but to differences in metabolic activity at the time of cooling.

258. DAVIES, R., AND BOYES, W. W. 664.85.22.035.1
Prestorage treatment of Santa Rosa plums with acetylene.
Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 25-30, bibl. 2.

From the commercial aspect these trials indicate that the treatment offers no possibility of improvement owing to the presence of abnormal softening.

259. HUELIN, F. E., AND TINDALE, G. B. 664.85.22.037
The cool storage of plums.
J. Dep. Agric. Vict., 1940, 38 : 247-53, bibl. 2.

The work reported was carried out by the Victoria Department of Agriculture and the Council for Scientific and Industrial Research. Several varieties of plum were picked at 2 stages of maturity and stored at 32° F. in air and in 5% and 10% CO₂. They were subsequently ripened at 45° and 60° F. and the storage life at 32° F. determined. When ripening after storage is at 60° F. (local use) most varieties can be stored for 6 weeks at 32° F., but for ripening at 45° F., i.e. after shipping for export, the limit at 32° F. is 4 weeks. Allowing 1 week at 32° F. for precooling and awaiting shipment the limit at 32° F. on board ship is 3 weeks, after which the temperature should be raised to 42° F. Most varieties take about 5 weeks to ripen at 45° F. after storage at 32° F. There are great varietal differences in length of storage life, the extremes being Wickson, which has so short a storage life at 32° F. (2 weeks) as to be unsuitable for export, while Cole's Golden Gage had a storage life of 8 weeks under the same conditions. For most varieties gas storage definitely decreased storage life and with some varieties as little as 2% CO₂ proved harmful. Gas storage slightly increased storage life of Cole's Golden Gage and Satsuma varieties. [From authors' summary.]

260. DAVIES, R., AND BOYES, W. W. 664.85.22.035.1
Prestorage treatment of Kelsey plums with acetylene and ethylene.
Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 31-40.

Two distinct problems concern the storage of Kelsey plums, namely, how to avoid internal breakdown and how to get satisfactory ripening. Treatment with acetylene or ethylene followed by immediate storage is generally effective in inducing ripening after storage. It may result in a small or large reduction in the incidence of internal breakdown and again in a small or large increase in "abnormal softening". The effect of acetylene treatment subsequent to storage appears to offer greater possibility of success. In tests with it abnormal softening was absent and there was no difficulty found in ripening. Internal breakdown was, however, appreciably present.

261. DAVIES, R., AND BOYES, W. W. 664.85.22.035.1
Pre-storage treatment of Elberta peaches with acetylene.
Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 41-3.

The effect of treating Elberta peaches in two stages of ripeness, viz. (1) green with tinge of colour and slight softening and (2) greenish-yellow to yellow with blush on cheek, soft, with 1% acetylene at 75° F. for 24 hours and then, after various delay, storing at 34° F. for 24 days with subsequent ripening at 45° F. was to hasten the delayed storage action without incurring the loss of flavour accompanying long delayed storage. Thus at the end of storage the controls were quite woolly and treated fruits stored immediately were the same. But with every increment of delay a decided improvement resulted, 3-4 days' delay after treatment being wanted to render all fruits juicy.

262. ISAAC, W. E. 664.85.25 : 547.313.2
The effect of ripe Elberta and Peregrine peaches on the respiration of unripe fruits of the same variety at 90° F.
Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 71-7, bibl. 2.

Under the conditions of the experiments ripe Elberta and Peregrine peaches stimulated the respiration of unripe fruits of the same variety, the extent of stimulation achieved being greater in the case of Elberta.

263. ISAAC, W. E. 547.313.2 : 634.85.22 + 664.85.25
A note on the effect of ripe Gaviota plums and Peregrine and Elberta peaches on unripe fruit of the same variety at 35° F.
Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 77-8.

There were indications that the inclusion of ripe Gaviota plums with unripe Gaviota plums at 35°, did affect rate of respiration in the latter but that a higher temperature was necessary for this to become apparent. The trials with the peaches were inconclusive.

264. NELSON, R. C. 547.313.2 : 664.85.11 + 664.85.771
Studies on production of ethylene in the ripening process in apple and banana.
Food Res., 1939, 4 : 173-90, bibl. 23.

A method is described for the determination of ethylene in plant tissues. Essentially it consists of introducing the ethylene into an evacuated bulb where it is oxidized by dilute potassium permanganate. In these trials a general correspondence was found to exist between the course of respiratory activity and that of ethylene content in stored apples. Varieties having longer storage lives were characterized by less ability to produce ethylene. Ethylene or a similar gas was produced by bananas during ripening. It appears likely that ethylene is consumed by bananas during the period of intensive ripening. The fundamental function of ethylene appears to be connected with the hydrolytic processes.

265. WAID, W. C., AND MACRILL, J. R.

634.3-1.563

Sanitation in packing houses pays.*Calif. Citrogr.*, 1940, 26 : 6, 28.

The wastage in citrus packing houses from blue and green mould (*Penicillium italicum* and *P. digitatum*) can be reduced by cleanliness achieved as follows:—Fumigation with chlorine gas ; this can only be used in the absence of fruit ; spraying walls, ceilings and floors with pine oil emulsion or other fungicide ; steam cleaning of houses and equipment ; use of a vacuum cleaner to collect dust and spores ; total removal or placing in closed containers of all decayed fruit. The spore count is always lower in houses using these or other routine methods of sanitation.

266. VAN DER PLANK, J. E., AND RATTRAY, J. M.

664.85.323.037

The effect of temperatures of storage from 40° to 70° F. on Marsh grapefruit.*Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,*
pp. 103-10.

Marsh grapefruit from Sundays River and Groot Drakenstein was stored at 40°, 50°, 60° and 70° F. for a month. The percentage of juice extractable with a hand reamer increased in store. This gain was the result of an absolute increase of extractable juice, storage apparently rendering juice more extractable from the skin and rag. The increase of juice was small at 40° F. and greatest at 60° F. The use of semi-moisture-proof wrappers of waxed crystalline paper appreciably increased the total quantity of juice extractable after storage. There were slight changes in the percentage of soluble solids and acid in the juice. At 40° F. these changes were inconsistent, but at warmer temperatures the ratio of soluble solids to acid decreased slightly during storage. Grapefruit of good keeping quality showed very little decay even when stored at 60° F. in boxes lined with waxed crystalline paper. The freshness and turgidity of the fruit was better preserved in lined boxes. [Authors' summary.]

267. VAN DER PLANK, J. E., RATTRAY, J. M., AND CROUS, P. A. 664.85.34.037

The storage of lemons.*Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,*
pp. 110-22.

Optimum temperatures have still to be found. Low temperatures, i.e. 40° F. do not improve quality or colour appreciably and appear to be without any compensating advantages. Temperatures between 50° and 55° allow appreciable colouring and curing and do not appear to require special humidity control. Higher temperatures, i.e. 60°, may affect beneficial changes in juice content and general quality but are as yet untested on a commercial scale. Shrivelling and wilting must become more pronounced. Box liners of waxed crystalline paper were used to retard shrinkage and wilting and may provide a solution to the problem, but they are purely in the experimental stage. Liners were found to increase waste by green mould. They did not affect colouring. They preserved turgidity in fruit but caused buttons to shrivel and drop off. Fruits in lined boxes retained more moisture.

268. METCALFE, E., REHM, P., AND WINTERS, J.

577.16 : 634.323 + 634.31

Variations in ascorbic acid content of grapefruit and oranges from the Rio Grande Valley of Texas.*Food Res.*, 1940, 5 : 233-40, bibl. 16.

Results of investigation by indophenol titration methods into the ascorbic acid content of grapefruit and oranges from the Rio Grande Valley of Texas showed that there was little variation as between varieties, considerable but inconsistent variation according to source, and a very definite reduction of ascorbic acid content at the end of the season. The values were closely comparable with those of fruit from Florida and California. Cold storage for a month did not affect ascorbic acid content nor did processing by heating for eight hours at 43·3° C. destroy Mediterranean fruit fly larvae.

269. VAN DER PLANK, J. E., AND RATTRAY, J. M.

664.85.3.038 : 632.4

The use of wraps impregnated with O-phenyl-phenol against mould in citrus fruits.*Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,*
pp. 88-93, bibl. 2.

Results with O-phenyl-phenol impregnated wraps for oranges and naartjies (tangerines) were inconclusive owing to the general low level of waste. With lemons the tendency to decay was

greater and with them the impregnated wraps proved very efficacious even when the preservative was low enough to give only slight injury. The use of glyceride oils with O-phenyl-phenol reduces injury considerably.

270. VAN DER PLANK, J. E., AND RATTRAY, J. M. 664.85.3.038 : 632.4
The use of solutions of O-phenyl-phenol and sodium O-phenyl-phenate as disinfectants for oranges.

Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 93-8, bibl. 2.

Although both O-phenyl-phenol and its sodium salt are both potent fungicides they differ greatly with regard to their solubility, action on the rind, the way in which they are affected by the temperature of the dip and the time of immersion in it. These differences and their importance are discussed.

271. VAN DER PLANK, J. E. 634.3-2.45 : 664.85.3
The use of mixtures of chloride of lime and sodium bicarbonate to remove sooty blotch from citrus fruits.

Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 98-103, bibl. 3.

A suitable mixture for treating citrus fruits affected with sooty blotch can be made by mixing chloride of lime and sodium bicarbonate. Such bleaching solutions are far more reactive than eusol. For commercial use a ratio of sodium bicarbonate to tropical chloride of lime of about 0.75 is recommended. Solutions thus made are unstable and must be made for immediate use.

272. VAN DER PLANK, J. E., AND RATTRAY, J. M. 664.85.31.038
The effect of lightly oiled citrus wraps on the behaviour of oranges in store.

Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 122-4.

Comparative tests were made of wrapping stored oranges in lightly oiled wrappers and in plain sulphite tissue wrappers. The only difference lay in a very slight reduction in loss of weight in favour of the oil wrappers.

273. VAN DER PLANK, J. E., AND RATTRAY, J. M. 664.85.31 : 632.4
A note on the effect of repacking navel oranges and its bearing on the question of the spread of *P. digitatum* by contact.

Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 124-5, bibl. 2.

In experiments with navel oranges the removal of fruits infected with green mould (*Penicillium digitatum*) did not alter the subsequent development of decay. It is therefore concluded that there was no tendency for infection to spread by contact from fruit to fruit.

274. VAN DER PLANK, J. E., AND VAN WYK, G. F. 664.85.872
The preparation of tablets for the release of sulphur dioxide in packages of stored table grapes.

Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 43-7.

An account is given of the making of tablets to be used in humid atmospheres for giving off sulphur dioxide in boxes of grapes. These tablets were prepared from dehydrated alum, anhydrous sodium bisulphite and spermaceti. The wax served both to control the uptake of water and as a granulating agent.

275. RATTRAY, J. M. 664.85.872
Grape wastage investigations 1938-39.

Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 48-60.

Sulphur dioxide was released in regulated amounts in packed table grapes of different varieties. When the bunches were wrapped in sulphite tissue paper fungal wastage was considerably reduced by the 3 concentrations of sodium bisulphite used, viz. tablets containing 0.12 gm.,

0.22 gm. and 0.44 gm., and no sound berries appeared to be affected. When the grapes were wrapped in waxed crystalline paper wastage was, indeed, reduced but bleaching by the SO_2 occurred throughout. Infection at "loose" necks was also reduced and desiccation of the stems was retarded by the SO_2 . Samples of grapes packed with 0.12 and 0.22 gm. sodium bisulphite were analysed for SO_2 absorption and the highest amount absorbed was only 5 parts per million, i.e. well within the amount tolerated, i.e. 350 parts per million.

276. RATTRAY, J. M. 664.84.61

Melon storage investigations.

Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940, pp. 66-70.

Waxing Honeydew melons did not lessen fungal wastage in store at 35° F. and accelerated it at 45° and 65° F. It resulted in pitting at 35° and 45° F. but not at 65°. It retarded ripening. Various fungicides in oil emulsions were ineffective in controlling wastage. Stem end rot was partly controlled by a 5% bluestone starch paste. Trials showed that the more mature a melon is on storage, the quicker is its deterioration at the warmer temperatures.

277. CRANG, A. 664.84

Preserving vegetables.

J. roy. hort. Soc., 1940, 65 : 250-1.

For home preservation of vegetables steam sterilization at 10 lb. steam pressure (240° F.) is recommended, the time of treatment varying from 30 to 70 minutes according to the vegetable. Drying can be done by immersing in boiling water for 2 minutes, draining and spreading on trays. If dried in the oven the temperature should not exceed 150° F. When dried the vegetables are allowed to cool before packing in containers and storing in a cool place. Others can be made into pickle or chutney. Pickles are made by leaving sliced vegetables covered with salt for two days, washing off excess salt, putting into jars and covering with spiced vinegar. Chutneys are made by cooking suitable fruits and vegetables with salts, spices and vinegar. Sugar can largely be replaced by the use of sweet dried fruit.

278. ANON. 664.84.25

Onion preservation in Hungary.

Tin-Print. and Canning Ind., 1940, 16 : 186 : 22.

A non-technical note is given of a new process to be set up at Mako in Hungary by which onions will be liquefied and packed in bottles. The innovation is considered as likely to have an important effect in many directions and to be of particular use in times of glut. Experiments are proceeding in the liquefaction of paprika with a view to establishing a plant at Szeged.

279. SWIFT CURRENT DOMIN. EXP. STAT. (AGRICULTURAL ENGINEERING DIVISION).

635.1/2 : 631.563

A practical farm root cellar.

Fmrs' Bull. Dep. Agric. Canada 98, 1940, pp. 7, being Publ. 708.

The measurements are given with hints on construction of a farm root cellar. A useful size is 14' x 10' x 6' in height. It must be properly ventilated and must be insulated from the outside by straw and earth layers.

280. PLATENIUS, H. 635.52 : 631.564/5

Handling and shipping lettuce in New York.

Bull. Cornell agric. Exp. Stat. 732, 1940, pp. 24, bibl. 4.

The methods at present used for handling and shipping lettuce in New York State are considered in some detail under the following heads :—containers, grading and packing, precooling, transportation. Consideration is given to the effect on the rate of deterioration of lettuce of truck and rail shipments, precooling and package icing. As a result the recommendation is made that lettuces should be closer trimmed than is normally done. Good quality specimens of high-class lettuce varieties should be precooled. Where package ice is used, it should be applied in 2 or 3 layers. Trucks should be well insulated and should not arrive at market too early. Iceberg lettuce of high quality is worth grading, packing and icing in a centralized packing house.

281. FLOYD, W. W., AND FRAPS, G. S. 577.16 : 634/635

Vitamin C content of some Texas fruits and vegetables.

Food Res., 1939, 4 : 87-91, bibl. 6.

Vitamin C content was determined for a large number of Texan fruits and vegetables by titration with 2, 6-dichlorophenolindophenol and figures are given. It is noticeable that greater amounts of vitamin C were recorded in cantaloups, muskmelons, peaches, mustard and persimmon than had previously been found.

282. BLACKIE, W. J. 634/635 : 577.16

The vitamin C values of some Fiji fruits and vegetables.

Fiji agric. J., 1940, 11 : 5-6.

The vitamin C content of certain common Fiji fruits and vegetables are recorded and the values for Fiji grown produce are found to compare favourably with those from other countries. The quantities of the various Fiji fruits and vegetables required for proper protection against scurvy are tabulated.

283. HODSON, A. Z. 634/635 : 577.16

Riboflavin content of some common vegetables and fruits.

Food Res., 1940, 5 : 395-8, bibl. 8.

Riboflavin contents of a large number of vegetables were determined by the fluorometric method of Hodson and Norris and are here tabulated. The green vegetables such as spinach, lettuce, broccoli and Swiss chard proved the best sources.

284. MACK, G. L., TAPLEY, W. T., AND KING, C. G. 635.65 : 577.16

Vitamin C in vegetables. X. Snapbeans.

Food Res., 1939, 4 : 309-16, bibl. 8.

A determination by a modification of the Tillmans method of the vitamin C content of 13 varieties of haricot bean showed that earliness of maturity apparently favoured a high ascorbic acid content. The effect of degree of maturity was also measured. The differences observed here should be ascribed to the distribution of the ascorbic acid between the shell and the seeds in the pod. Cooking tests showed that the vitamin was very little destroyed by boiling, but that much of it was extracted in the cooking water.

285. FELLERS, C. R., ESSELEN, W. B., AND FITZGERALD, G. A. 664.84.037 + 664.84.036.5 : 577.16

Vitamin B₁ and vitamin B₂ (G) content of vegetables as influenced by quick freezing and canning.

Food Res., 1940, 5 : 495-502, bibl. 12.

A comparison of the vitamin B₁ and vitamin B₂ content of fresh asparagus, peas, lima beans and spinach with that of the same substances quick frozen and canned shows that both types of preserved food retain nutritionally significant percentages of these two water-soluble vitamins.

286. SUGAWARA, T. 664.84.41.035.1 : 577.16

The effect of carbon dioxide on the ascorbic acid contents of stored spinach.

[Japanese, English summary 1 p.]

J. hort. Ass. Jap., 1940, 11 : 288-99, bibl. 23.

The ascorbic acid content of leaf tissue of Japanese spinach was strongly influenced by the CO₂ in the air in storage, the highest content being found in the sample which had been kept in the lowest concentration of CO₂. The disappearance of reduced ascorbic acid in storage began rapidly in contact with CO₂ regardless of temperature. After loss of ascorbic acid during storage in air containing much CO₂ there was no complete recovery even if extract of tissue was treated with hydrogen sulphide for 30 minutes. [From author's summary.]

287. TODHUNTER, E. N. 664.84.656.037 : 577.16

Vitamin values of garden-type peas preserved by frozen pack method. II*

Vitamin A.

Food Res., 1939, 4 : 587-92, bibl. 7.

The biological method was used to observe differences in vitamin A content of frozen pack preserved garden peas. There was no difference corresponding to temperature or length of

* For I, see *Ibidem*, 1939, 3 : 489-98.

scalding before freezing. Cooking by boiling did not affect the vitamin A content. A certain amount of varietal difference in vitamin A content was noticeable.

288. FINCKE, M. L. 664.84.656 : 577.16
Vitamin values of garden-type peas preserved by frozen-pack method. III.
Thiamin (vitamin B.)
Food Res., 1939, 4 : 605-11, bibl. 8.

The biologic method was used in the trials here described. A general trend was observed toward lower vitamin B₁ content of peas which were scalded for a longer time and at higher temperatures prior to freezing, although this was only significant in the case of those blanched for 2 and 3 minutes at 99° C., i.e. the highest temperature used. No significant difference in vitamin B₁ content resulted whether steam or water was used for blanching or whether they were frozen at once or kept at room temperature for 4-8 hours.

289. STIMSON, C. R., TRESSLER, D. K., AND MAYNARD, L. A. 664.84.656.037 : 577.16
Carotene (vitamin A) content of fresh and frosted peas.
Food Res., 1939, 4 : 475-83, bibl. 18.

The carotene content of freshly frozen, blanched Thomas Laxton peas was found by biological methods to be much the same as that of freshly harvested peas. After storage at -40° C. for 11 months there was no appreciable loss, but after storage at -17.8° C. there was a loss of from 7 to 26% of the carotene.

290. WHEELER, K., TRESSLER, D. K., AND KING, C. G. 635.1/7 : 577.16
Vitamin C content of vegetables. XII. Broccoli, cauliflower, endive, cantaloup, parsnips, New Zealand spinach, kohlrabi, lettuce and kale.
Food Res., 1939, 4 : 593-604, bibl. 21.

Biological method results were largely in agreement with dichlorophenolindophenol titration values. The approximate vitamin C values in mg. per gramme were as follows:—parsley 2.0, broccoli 1.3, kale 1.3, cauliflower .9, kohlrabi .65, N.Z. spinach .45, cantaloup .35, lettuce .15 and endive .14. At room temperatures most of these lost ascorbic acid quickly. Loss was greatly decreased by freezing in broccoli, cauliflower and endive, but was not much affected by freezing in lettuce and kale. Parsnips lost much of their vitamin C in winter storage.

291. DREOSTI, G. M. 664.84/85
Automatic temperature control in experimental cold storage rooms.
Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 126-43.

DAVIES, R., AND BOYES, W. W. 664.85.22.037
Respiration of Santa Rosa plums.

Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 30-1.

VAN DER PLANK, J. E., AND RATTRAY, J. M. 664.85.3 : 632.4
The relative efficacy of O-phenyl-phenol against various [8 species] citrus-rotting fungi in culture.

Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 p. 88.

TSUKAMOTO, Y. 634.451 : 581.192
On the vitamin C and oxidizing enzymes in kaki fruit. [Japanese-English summary 1 p.]

J. hort. Ass. Jap., 1940, 11 : 266-87, bibl. 77.

JONES, A. H., AND LOCHHEAD, A. G. 664.84.037
A study of micrococci surviving in frozen-pack vegetables and their enterotoxigenic properties.

Food Res., 1939, 4 : 203-16, bibl. 22.

SMART, H. F. 664.85.73.037
Further studies on behaviour of micro-organisms in frozen cultivated blue-berries.

Food Res., 1939, 4 : 287-92, bibl. 4.

SMART, H. F. 664.84/85.037

Microbiological studies on commercial packs of frozen fruits and vegetables.

Food Res., 1939, 4 : 293-8, bibl. 6.

FLOYD, W. W., AND FRAPS, G. S. 635.127 : 577.16

Changes in vitamin C content during boiling of turnip greens in various waters in covered and uncovered containers.

Food Res., 1940, 5 : 33-41, bibl. 18.

McFARLANE, V. H. 664.84/85.037

Behavior of microorganisms at sub-freezing temperatures. I. Freezing redistribution studies. II. Distribution and survival of microorganisms in frozen cider, frozen syrup-packed raspberries and frozen brine-packed peas.

Food Res., 1940, 5 : 43-57, bibl. 12, and *Ibidem*, 5 : 59-68, bibl. 8.

PACKING AND PROCESSING.

292. DREOSTI, G. M., AND WISSING, P. 634.3-1.564
Citrus box tests.

Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 161-72.

An interesting account of boxes tested is summarized as follows :—A few examples of different kinds of boxes are discussed in relation to the Laboratory tests, in order to indicate the use of the present service in the consideration of new proposals. The variety of box-types offered for tests may be gauged by the inclusion in the present tests of a nailed but strapless box, a strapped but nailless box, and a wire-bound box. Each type is shown to possess certain advantages and disadvantages, and the analysis includes a discussion of the probable consequences of the various weaknesses in practice.

293. DREOSTI, G. M. 634.3-1.564
Testing schedule for export citrus cases.

Rep. Low Temp. Res. Lab., Capetown, for year June 1938 to June 1939, 1940,
 pp. 173-80.

Notes are given as to what is implied by the terms used in judging the value of packing cases. They include descriptions of materials and boxes ; dimensions and weights of materials and boxes ; rigidity of slats ; brittleness of slats and ends ; concentrated load on end ; fixing together of slats to ends and centre pieces ; strapping or wiring ; assembly of packages ; facility for repairs ; facility for inspection ; opportunity for pilfering ; shrinkage ; suitability for cold storage ; load ; rigidity of box ; ability to stand rough handling, etc., etc.

294. ANON. 663.25
Roma Wine Company begins commercial development of wine yeast cultures.

Food Prod. J., 1940, 20 : 52.

A brief note on the establishment at Fresno, Calif., of the first yeast laboratory installed in a winery in the U.S.A.

295. LINDEMAN, B. W. 663.813 : 634.8
Unfermented grape juice : how to make it in the home.

Orchard. N.Z., 1940, 13 : 73-4, 76-7.

The procedure in making unfermented grape juice is fully described. It may be summarized as follows :—1. Select the best available variety. 2. Use only fully ripe, sound and clean fruit. 3. Crush the fruit. The first crushing as distinct from pressing releases a high-quality juice which is known as free-run juice. It may be handled separately or mixed with the pressed juice. 4. Press the fruit without excessive pressure or the juice will be cloudy and astringent, and for not more than 3 or 4 hours or it may ferment. 5. Allow the juice to stand for 5-6 hours to settle. 6. Strain through clean double cheese cloth without disturbing sediment. 7. Sweeten with

sugar, acidify with citrus acid or blend if necessary. 8. Filter through a flannel jelly bag several times to ensure clarity. 9. Fill the storage jars to the neck and cover with glass tops. 10. Place in a pasteurizer as in fruit bottling with the tops of the jars 2 inches above water level and heat to 185° F. 12. Seal and store in a cool, dark, dry place until the juice is cleared by crystallization and the precipitation of argol.

296. MORGAN, A. F., AND OTHERS. 577.16 : 663.25 + 663.813
The B vitamins of California grape juices and wines.
Food Res., 1939, 4 : 217-29, bibl. 13.

Whereas grape juices preserved either by freezing, storage or pasteurization quickly lost their vitamin B₁ and riboflavin content, the vitamin B₁ and riboflavin contents of wine, which were about one-third to one-quarter that present in freshly extracted grape juice, were apparently not affected by aging, though they fell by nearly 50% as the result of sulphiting the must before fermentation and clarifying with bentonite clay later. White wines were richer in riboflavin than red. This substance was retained nearly unchanged during storage.

297. ARENGO-JONES, R. W. 663.813 : 634.11
The preparation and preservation of apple juice.*
Fruit Prod. J., 1940, 19 : 327-30, 356-8, 375, 377, 20 : 7-9, 23, 47-51.

The author gives a well-illustrated account of the latest process of apple juice manufacture from start to finish as practised at Ottawa. Among other points dealt with are the following. Plant lay-out. Varieties and blends used successfully at Ottawa and in B.C. In Eastern Canada the juice of well-ripened McIntosh will supply good flavour in combination with less highly flavoured varieties. Washing, milling and pressing. Clearing, using the gelatin-tannin and enzyme treatments. Filtration and filters. Sterilization by flash pasteurization. Containers (cans are favoured). Flash pasteurization of cloudy and of clear juice and cooling. Pasteurization in bottle. Sterilization by filtration. Preservation with sodium benzoate. Carbonating apple juice, the steps involved being (1) treatment of juice with pectinol or gelatin-tannin, (2) filtration, (3) flash pasteurization and flash cooling, (4) carbonation, (5) sterilization and bottling. In three appendixes the author deals with carbonation with dry ice, sterilization of bottles and crowns and preservation of apple juice for home use.

298. NOLTE, A. J., AND VON LOESECKE, H. W. 663.813 : 634.3
Types of organisms surviving in commercially pasteurized citrus juices in Florida.
Food Res., 1940, 5 : 73-81, bibl. 6.

Examinations made at Winter Haven, Fla, show that high-short [flash] pasteurization of orange and grapefruit juice as practised in the canneries studied is efficient in destroying organisms which may later cause biological spoilage.

299. JOSLYN, M. A., AND SEDKY, A. 663.813 : 634.3
Effect of heating on the clearing of citrus juices.
Food Res., 1940, 5 : 223-32, bibl. 11.

The effect of pH, temperature and time of heating on the inactivation of enzymes responsible for the clearing of citrus juices was investigated in California. It was found that clearing of juices occurred at lower rates, the higher the temperature or the longer the time of heating ; that the enzymes in oranges and grapefruit were somewhat more heat-resistant than those in lemons ; that the enzymes in Valencia oranges were more heat-resistant than those in navel oranges ; that the heat inactivation was more rapid at the lower of the two pH values studied, i.e. pH 4 and pH 2.2.

300. NOLTE, A. J., AND VON LOESECKE, H. W. 663.813 : 634.31
Chemical and physical characteristics of the petroleum ether soluble material of fresh and canned Florida Valencia orange juice.
Food Res., 1940, 5 : 457-67, bibl. 11.

In fresh juice the petroleum ether soluble matter in oranges was found to be unidentified waxy bodies, insoluble in petrol ether ; oleic, linoleic, cerotic, palmitic and stearic acids ; unidentified

* See also Charley, V. L. S., and Harrison, T. H. J. Fruit juices and related products. *Tech. Commun. Bur. Hort. East Malling*, 11, 1939. 5s.

aliphatic alcohols and resins; phytosterols; sterols; and carotinoid pigments. In old canned orange the fatty matters had undergone oxidization and had become rancid, which would account for off-flavours in such juice.

301. FULLER, J. E., AND HIGGINS, E. R. 635.25 : 632.3

Onion juice and bacterial growth.

Food Res., 1940, 5 : 503-7, bibl. 6.

Studies on growth inhibiting properties for several species of bacteria.

302. MOTTERN, H. H., AND NEUBERT, A. M. 664.85.25.036.5

Canning soft-ripe free stone peaches.

Fruit Prod. J., 1940, 19 : 293-6, bibl. 8.

The newer development of canning freestone peaches in the soft-ripe rather than the usual hard-ripe stage is discussed. The new method retains the full peach flavour and soft texture. The fruit, which must be carefully transported, is peeled (a) by halving and steam treatment, or (b) by halving and lye treatment, or (c) by immersing the whole fruit in a bath before pitting. The syrup is 50-55% for Fancy grade, though often 40% is used, resulting in better flavour. The ragged frayed appearance of the product is a disadvantage and other difficulties to be overcome are determination of optimum maturity, the discovery of efficient methods of processing and the selection of suitable varieties with widely spread harvest dates. The progress made so far in these directions is discussed. The commonly used varieties are J. H. Hale and Elberta but among others coming to the fore and possibly superior are Gold Medal, Early Elberta and Red Elberta. The individual peculiarities of these are noted. With a proper selection of varieties a uniform supply of peaches for canning purposes may extend over 6 weeks.

303. MCCORNACK, A. A., FELLERS, C. R., AND MACLINN, W. A.

664.85.11.036.5

Canned dessert apples.

Fruit Prod. J., 1940, 20 : 5, 6, 25, bibl. 2.

Experiments from Massachusetts are briefly described. Of the apples used Northern Spy, Northwest Greening, Arkansas and Stark gave the best product. The process recommended is as follows:—1. Wash, peel, core, trim and section into eighths or sixteenths. Dice or slice into rings. 2. Put prepared pieces into a 10% sucrose syrup and deaerate under a vacuum of 24 inches of mercury or more for 10-15 minutes. 3. Fill into cans and cover with a 35% sucrose syrup. Up to 2½% honey or 20% dextrose can replace part of the sucrose. 4. Vacuum-seal and process the cans at 212° F. Diced apples in No. 2 cans are processed for 10 minutes and apple rings and slices for 15 minutes at this temperature.

304. JOHNSON, W. J. B. 664.85.774.036.5

Recent reorganization and research in the Malayan pineapple canning industry.

Malay. agric. J., 1940, 28 : 436-45.

The regulations which came into force early in 1939 with the object of replacing the Malayan pineapple canning industry on its feet are briefly noted. They provide *inter alia* for registration of factories subject to certain provisions, the establishment of a representative Association, the sale of canned pineapples only to that Association, unless otherwise authorized, at a price to be fixed by them from time to time, Government representation with very definite powers of control, the adoption within two years of a grading scheme, probably under the Malayan Mark. *Research.* The Sarawak pine was found, contrary to previous opinion, to can satisfactorily provided it is not overcooked, whereas the Singapore pine is unaffected by overcooking to twice the normal cooking time. The Sarawak pine averages 1½ lb. heavier than the Singapore pine and is more uniform in shape and size. It is comparatively disease-free. Its prime condition for canning is when the two or three lowest whorls of fruitlets show yellow coloration. The flavour of Sarawak pine when canned is sweeter but less pleasantly acid than the Hawaiian pine. Unripe canned Sarawak fruit is white and overripe fruit becomes spotted and cannot be used. It has no degree of ripeness which corresponds to the Standard grade for Singapore pine. Other practical points in favour of Sarawak pine compared to the Singapore variety are that the percentage of cut fruit is greater in the former and it requires a sugar syrup of lower density, the difference effecting a saving of about 1,200 lb. of sugar in every 1,000 cases

of 48 1½ lb. Squat cans. It lacks, however, the bright golden colour of Singapore fruit. Investigation on the two juices reveals that Singapore pine juice is of good colour and appearance but insipid in taste, Sarawak being paler but better flavoured. Best results in both cases are obtained by filling the cans with cold fresh juice and pasteurizing the cans in tanks of hot water at 170° F. for ¼ hour. Heating above this in closed cans or any heating at all in contact with the atmosphere causes deterioration. Singapore flavour can be improved by blending the juice of the ripe and unripe fruit. Juice of superior flavour is yielded by small fruits from plants in their 4th and 5th years. Some results of investigations on the technique of canning these pines are discussed. Average weight investigations disclosed that 70 Singapore fruits of an average weight of 3 lbs. are required to fill one case of 48 1½ lb. cans. Only 55 lb. of Sarawak pines of similar weight are required for the same purpose. Other work in progress but not discussed is the utilization of pineapple waste including composting, can-lacquering trials, the manufacture of jam, etc.

305. SPIEGELBERG, C. H. 664.85.774.036.5 : 632.3
Some factors in the spoilage of an acid canned fruit.
Food Res., 1940, 5 : 439-55, bibl. 17.

Factors involved in the spoilage of an acid canned fruit [pineapple] caused by various named and unnamed bacteria are discussed. Experimental results indicate that control should consist of maintaining the final pH of cans at or below 4.4 and processing to give a temperature of 190° F. or above in the fruit from the cooker.

306. ANON. 664.84.938.59.036.5
Canning the cactus plant.
Tin-Print. and Canning Ind., 1940, 16 : 188 : 8.

The young leaves of a cultivated cactus, of which the botanical name is not given, are being successfully canned in Los Angeles, California. The colour is a pleasing bright green and the taste is that of string beans of the best quality.

307. WIEGAND, E. H., NORTON, C. E., AND PENTZER, D. J. 664.85.23.035
Investigations of the cracking problem in brining of sweet cherries.
Food Res., 1939, 4 : 93-100, bibl. 4.

The pH value of brine solutions is found to be a factor in preventing cracking of cherries. The type of alkali is also important, thus pH values must be higher when sodium or potassium than when calcium is used. The optimum pH differs with variety.

308. NICHOLS, P. F., MRAK, E. M., AND BETHEL, R. 664.85.21.047
Effect of drying and storage conditions on color and SO₂ retention of dried apricots.
Food Res., 1939, 4 : 67-74, bibl. 13.

Work in California shows that apricots dried in warm and relatively dry districts retain more SO₂ and a better colour than those dried in cool and foggy districts. Complete drying in shade increases the drying time and reduces SO₂ retention. The decrease in SO₂ content during storage of dried apricots varies with the storage temperature, length of storage and moisture content of fruit and neither it nor colour deterioration is prevented by storing in air, nitrogen, CO₂ or a vacuum. The colour varies with the drying conditions under which produced and the storage temperature.

309. FABIAN, F. W., AND ERICKSON, F. J. 664.84.64.036.5
Salting of green tomatoes.
Fruit Prod. J., 1940, 19 : 363-7, 377, 379, bibl. 9.

Experiments indicate that the best fermentation occurs in a 30 degree salometer brine to which had been added 2.5% dextrose by weight of the green tomatoes. The dextrose ensures the more rapid production of acid at the beginning of the fermentation, at which point and sometimes at the end of fermentation the amount of acid may be insufficient to prevent spoilage.

310. ATENG, R. 633.61 : 664.1.031

Home manufacture of sugar from sugar cane.

Mag. Malay. agri-hort. Ass., 1940, 10 : 127-8.

Sugar can be manufactured for domestic use by smallholders and others as follows. The canes are pressed by wooden press rollers, a solution of lime being added to the juice. The juice is then filtered through a filter cloth and boiled on open iron pans, until it reaches a thick syrupy consistency. The lime precipitates the gums and colouring matter and neutralizes the acids in the juice, and on heating causes the proteins to coagulate. The boiling is concluded when samples of the syrup become solid in cold water. The sugar is poured into earthen pots of conical shape, with a hole in the bottom (flower pots will do) which are corked. The pots are filled three-quarters full and the sugar left to cool for 2-3 hours. After cooling the skin is scraped off with a knife and the rest of the pot filled with mud. The cork at the bottom is removed and in about 10 minutes the molasses will drip out into receptacles placed underneath. After 14 days the dry mud at the pot top is cleaned off and the pot emptied by turning it upside down. A conical sugar loaf results of a greyish colour which cannot be further whitened without dissolving too much of the sugar. The cone is further dried in the sun and packed in the conical pots, which have meanwhile been dried, for use as required.

311. WATTS, B. M., AND MORSE, L. 635.655

Soybean flour as an emulsifying agent in preparation of salad dressings.

Food Res., 1940, 5 : 197-203, bibl. 2.

Benzine-extracted, undenatured, soybean flour heated with water was successfully used as an emulsifying agent in the preparation of salad dressings. The flavour of the cooked but not of the uncooked dressings was acceptable.

312. J(ACK), H. W. 633.821

Vanilla. Notes on curing Tahiti vanilla beans.

Fiji agric. J., 1940, 11 : 22-3.

The beans must be picked quite ripe, i.e. when showing a yellowish colour. They are heaped on the wooden floor of an airy room and covered with a cloth. Ten days later they will be a dark brown colour and they are then well washed in cold water to remove dust, etc., a sunny morning being chosen. The washed beans are spread on tables in the sun and covered with black blankets. By 2 p.m. the beans will be warm, and ready to be neatly packed in large shallow tins over which, when nearly full, the hot blankets are folded. This process is repeated daily for 2-3 weeks until the beans have become wrinkled and have a shiny oily appearance. They are now spread on shelves of galvanized wire netting which may be stacked one above the other with a foot interval, the lowest being about 2 feet from the ground. This is the fermenting stage. Every day each bean must be held by the lower end between finger and thumb and with the other hand gently massaged from the lower end towards the thinner curved end; this softens it and distributes some of the essential oil more evenly. The process may last some weeks and as the beans start to dry they are stored in covered tins to prevent over drying. When all are dry they are graded for length by quarter-inches and are tied in bundles of 50-60 by thin string at both ends, the curved beans in the centre and the straight ones on the outside. The whole curing takes 3 months and must not be hurried. In Tahiti the curing is done by the Chinese who purchase green beans at about one-third of the estimated price for cured beans.

313. ANON. 634.39 : 668.64

Jak tree resin from Ceylon.

Bull. imp. Inst., 1940, 38 : 294-7.

The dried latex of the jak tree of Ceylon, *Artocarpus integer*, has been examined at the Imperial Institute. A note of its composition is given. A commercial firm to whom a sample of the material was furnished was sufficiently interested to ask for further samples.

314. SMITH, E. H. G. 634.531

Chicle, jelutong and allied materials.

Bull. imp. Inst., 1940, 38 : 299-320, bibl. 29.

Chicle is of economic importance on account of its use in the manufacture of chewing gum. It is a product of the latex of the sapodilla, *Achras Zapota* L. The chicle is collected from wild

trees in Brazil, British Honduras and neighbouring countries. Many trees are unnecessarily killed by careless tapping. The trees are re-tappable between the original cuts after 6-8 years or after 3 years on an area of the trunk previously left uncut, if the tree is in good health. The collected latex is boiled to reduce the water content to a point at which it will set on cooling and is then placed on canvas rubbed with soap to prevent sticking, and kneaded into blocks which may weigh up to 25 lb. After 2-3 days' drying the blocks are packed for export in bales weighing about 100 lb. Jelutong or Pontianak is the coagulated latex of species of *Dyera* occurring in Malaya, Sarawak and adjacent territories. It had a little commercial value as an inferior and resinous rubber, but in 1922 it found an important outlet in the production of chewing gum base, chiefly in the United States. In preparation the latex is first coagulated, then "refined", a process in which water content is reduced by boiling, once at the collecting camp and again at the depot. The coagulation and refining processes, less simple than in the case of chicle, are described. Commercial plantations of chicle are improbable since the trees are not tappable until 30 years old. Jelutong can be tapped somewhat earlier, but establishment of the trees is difficult and slow and the market too limited to make planting worth while. A number of other trees of various genera which have been and are occasional sources of suitable chewing gum bases are briefly mentioned.

315. ANON. 633.491-1.57

Potato products.

Food Manuf., 1940, 15 : 228-30.

Four years ago a potato products factory was opened in Cambridgeshire. The results have been outstandingly successful and the erection of further factories is planned. The elaboration of the different products of the potato is described, these being potato flour, farina or starch, potato dextrine and potato glucose. A note is given of the use to which the various products can be put. It is also added that at present in Germany 35% of the total German paper production is derived from potato leaves.

316. HALEWIJN, E. K. E. 633.522-1.56

De winning van Manilla-hennep met behulp van een mechanisch gedreven hand-ontvezelapparaat. (*A hand-driven decorticating machine for Manila hemp.*)

Bergcultures, 1940, 14 : 972-9, bibl. 4.

A hand-driven machine for use in the manufacture of Manila hemp fibre is described and "blue print" drawings are given of the machine in plan and elevation. The advantages of this machine in quantity and quality of output compared with the more primitive methods in which every process is done by hand are very great.

NOTES ON BOOKS AND REPORTS.

317. DE VRIES, L. 41.3=4=2 : 5

German-English science dictionary.

McGraw Hill, Aldwych House, London, W.C.2, 1939, pp. 473, 21s.

This seems to the reviewer quite the most useful of the German-English dictionaries published in recent years for the student of agricultural science.

It is essentially for the man who already knows a certain amount of German but is perplexed by the technical terms. Whether his bent is entomology, physiology, botany or other subject he is likely to be greatly helped.

Co-operators in compilation include 34 members of the graduate faculty of Iowa State College. The entries number 48,000. The book is clearly printed and handy for the pocket. The reviewer is particularly grateful for the list of some 264 abbreviations and their English equivalents.

While its size commends it to the individual, its contents even more commend it to the librarian.

318. TOTHILL, J. D. (EDITOR). 633/635

Agriculture in Uganda.

Oxford University Press, London, Humphrey Milford, 1940, pp. 551, 20s.

This book is a result of the joint efforts of the Staff of the Department of Agriculture, Uganda, of which the editor was lately Director. It is sponsored by the Uganda Government and deals with agriculture and related subjects such as land tenure, a proper understanding of which is necessary for a full appreciation of the agricultural problems of the country. While much of

the material has already been published in departmental documents of various kinds there is much that is new. The "unduly large amount of space" devoted to entomology is adequately excused on the ground that it represents the careful work of a twenty-year period on a long list of insects that attack all the crops of any importance grown in the Protectorate and that publication here of the results of this useful work will render it permanently and easily available for reference purposes. The book is divided into 22 sections. The first three contain respectively the introduction, a very vivid and interesting description of native agriculture as it was and is, and an account of the seven experiment stations and farms. Sections 4 to 19 deal in great detail with the various native crops, of which there are many, and sections 20-22 are concerned with beekeeping, locusts, marketing and agricultural education and extension work. The entomological work to which reference has been made will be found under each of the crops concerned. The illustrations are good and there are meteorological and road maps. The book, packed with information on every page, will be of interest and use to all concerned with tropical agriculture in any part of the world and, though this is probably the last thing intended, stands as a permanent record of the devotion to duty, untiring zeal and, we should think, limitless patience required of and freely given by the Colonial Agricultural Services.

319. SCHILLETTER, J. C., AND RICHEY, H. W.

634+635

Textbook of general horticulture.

McGraw-Hill, New York and London, 1940, pp. 367, bibl. 21s.

The object of this book is to set forth the essential principles of horticulture in a manner suitable for a general introductory college course and in so doing to treat each division of the science, for such it has now become, so as to result in a well-balanced presentation of the subject matter as a whole. A general textbook of this nature has long been needed and we can say at once that the work has been well done. Since the subject is so vast it was considered impracticable to deal with specific crops, the more so as these all possess a comprehensive literature of their own, and the approach to the matter is therefore from the viewpoint of fundamentals. Thus the emphasis for the performance of certain practices is based on the reasons for them rather than on the technique involved in carrying them out. If this is borne in mind the scope of the book can be well gauged from a perusal of the table of contents. The opening chapters survey horticulture as a whole, dwell briefly on its importance to the world and discuss various horticultural enterprises of the world, the United States and the home, the last dealing with the lay-out and maintenance of a home garden as an amenity to the house and a source of supply to the kitchen. Since little biological knowledge on the part of the reader is assumed, two chapters are devoted to an outline of the structure and function and growth of horticultural plants. Following these are chapters on the horticultural plant in relation to temperature, moisture, light and soil and the authors do not fail to incorporate results obtained in these fields by recent research. The chapter on soil management will be found particularly instructive. The subject of propagation can only be disposed of in a single chapter by a description, very well illustrated, of the principal methods in use and a discussion of the many treatments which may (or may not) hasten or ensure rooting. Chapters on training and pruning, the control of pests and diseases, on harvesting and finally on storage follow. This last chapter is very brief, and though low temperature storage is mentioned gas storage is not, a rather curious omission in view of the thoroughness which the authors have brought to their task in all other respects. What seems to be a novel feature is the presentation of two sets of questions instead of the usual one, at the end of each chapter. The second set presents practical problems designed to assist the pupil to use his judgment in solving the many horticultural conundrums which he will encounter from time to time. Some of them are knotty enough to make us wish the authors had provided (overleaf) a key to their unravelling. Very useful suggestions are made for collateral readings in relation to each subject. Even for the horticulturist who is self-confident enough to feel that he has passed the student stage the book will be found very convenient for quick reference.

320. LAURIE, A.

663.61 : 581.084.1

Soilless culture simplified.

McGraw-Hill, New York and London, 1940, pp. 201, 12s. 6d.

Of the making of good use of hydroponics there is no end. The flood has not yet attained the proportions assumed by the literary outpourings on that other horticultural Benjamin, the

plant auxin, but it is getting on. This is not a complaint but a compliment to the tireless energy of horticultural writers. Apparently it is only reviewers who get tired. As for the public, their reading is optional. This book, however, approaches the subject somewhat differently to most. A considerable part of it is devoted to the principles of plant nutrition and the problems of plant feeding and the information will be of considerable value to any grower whether interested in soilless culture or not. The chapter on the nutrient deficiency symptoms of some horticultural flowering plants is particularly instructive and represents the results of the author's own work. The second half of the book devotes chapters to the actual methods of growing crops in sand, gravel and even water, though as regards this last the author states definitely that his inclinations are away from it (as a culture medium). He thinks that its only advantage is availability of a large quantity of solution to compensate for a high transpiration rate in summer. Otherwise gravel is the root-holding medium advocated and the use of nutrient solution in gravel is considered to be definitely commercially practicable and to be fraught with fewer possibilities for trouble. Compared with soil, 50-75% of the hand labour is eliminated. The chief technical instructions as regards the installation of the plant and its use and treatments are therefore based on the employment of this material. There is a chapter devoted to the interests of the amateur. A quite lengthy list, with cultural notes, of ornamental plants that may be grown without soil is given and includes, incidentally, the long-suffering aspidistra, here expressively named "The cast iron plant", a new one on us. The book is concerned chiefly with general principles and their application, but when specific crops are briefly dealt with it will be found that they are mostly foliage and floral and that food crops are more or less disregarded. This is by no means a disadvantage since much of the literature already published deals adequately with these last, while the former have been comparatively neglected. As the author states in his preface he has had much experience in the use of nutrient solutions in a practical way (being, in fact, the Professor of Floriculture at Ohio State University) and he has a wide familiarity with the problems concerned. He presents what is known in a readable and simple manner while admitting that much remains to be learned before any absolute assurance of success can be guaranteed.

321. PHILLIPS, A. H.

663.61 : 581.084.1

Gardening without soil.

C. Arthur Pearson, London, 1939, reprinted 1940, pp. 139, bibl. 14, 3s. 6d.

This small manual endeavours to give a complete review of all the methods of the science of hydroponics in present practice, beginning with the most simple with which any amateur can experiment in his greenhouse. No better results are claimed for soilless culture than can be obtained under soil conditions. The point is that ideal soil conditions are more expensive and difficult to obtain and maintain while the heating of nutrient media, which is an important supplementary aid, is easier and less expensive in hydroponic tanks than the use of heating cables in soil. With regard to this heating it may be mentioned that experiments have shown that an average nutrient temperature of 70°-75° F. is essential and sufficient for heavy crop production but that anything over this represents a waste of money. The necessity for heating need not daunt the amateur provided electricity is available. Full instructions are given for simple ways of maintaining the temperature in even the smallest receptacles. To cope with any scarcity of chemicals in war time it is explained that good crops can be grown in plain sea water diluted with an equal quantity of tap water, a teaspoon of saltpetre being added to each gallon of solution, or if sea water is not available a mixture of saltpetre, alum-free baking powder, washing ammonia, iron solution and water will be equally effective. The claims of aggregate culture are also stressed. Aggregate culture is the growing of plants in some medium resembling soil, such as peat, sand, etc., to which the nutrient solution is applied. The method presents less attendant problems than pure hydroponics. Aeration is automatically taken care of, soil heating is less necessary, plants can be grown from seeds without transplanting, a more or less normal medium and a proper support for the root processes is provided. For miniature or single culture units the method is definitely preferable. Twenty-five different nutrient formulae have been published and of these the author presents six to meet three seasonal and climatic conditions. The fact that this book is full of "tips" often ignored in more costly works is one of its chief merits and will make it invaluable to the beginner but, of course, the

essentials are not ignored and a nutshell description is given of the plant required and methods adopted by the most up-to-date commercial establishments; a chapter is even devoted to the raising of forage for farm stock. But primarily it is a book for the beginner and indubitably one no beginner can afford to be without. It will save him a whole lot of expensive reading elsewhere.

322. HILYER, C. I.

663.61 : 581.084.1

Hydroponics. Food without soil.

Penguin Books Ltd., Harmondsworth, Middlesex (Penguin Special S63), 1940, pp. 116, 6d.

This little book should prove a useful introductory manual to the intelligent amateur who is attracted by the possibility of growing his own vegetables despite restricted gardening space, but does not know how to begin. The author gives a detailed account of her experiments in the open between 1938 and 1940 in tanks lined with roofing felt and provided with a mesh tray to support the plants. She used galvanized iron for the mesh but thinks that thin wooden slats interlaced with string netting soaked first in boiling water might be better. The mesh was covered with $\frac{1}{4}$ " "excelsior" (wood wool shavings) at the bottom with 1-2" peat moss above. In the second year sand boxes were used for the initial sprouting of seeds which were later transferred to the water tanks. All sorts of vegetables were grown, such as scarlet runner and broad beans, onions, carrots, cabbage, lettuce, marrow, tomato, spinach, pea, seakale, potatoes. The opinion of Gericke that especially those vegetables which have a high water and carbohydrate content are suitable for water cultivation, e.g. peas, beans, etc., was confirmed. Notes are given on all practical points such as aeration, supply of chemical food, etc., and many useful tips are given in an appendix. It would certainly appear from this book that the careful amateur might well consider taking up this comparatively new and, possibly, even profitable hobby and that the application of the principles on a larger scale are worthy of serious investigation.

323. BRITON-JONES, H. R.

634.61-2.4

The diseases of the coconut palm.

Baillière, Tindall & Cox, London, 1940, pp. 176, bibl. 250, price 10s. 6d.

In the foreword we are told that the manuscript of this book was completed only a short time before the author's death in November 1936. This manuscript has been revised and supplemented by Professor E. E. Cheesman of the Imperial College of Tropical Agriculture, Trinidad, to form the present volume, the object of which is to give growers and agricultural officers in the tropics an account of the diseases of the tall coconut palm (*Cocos nucifera* L.) in simple English. The information on these diseases has been mostly scattered in papers and bulletins not readily available to the grower, as shown by the comprehensive bibliography of 250 references, and the conclusions drawn by previous workers, together with the author's own observation, brought together here in an attractive form, should prove most useful to all who are interested in the cultivation of the coconut. The last compilation of the diseases of this plant, for agricultural officers and planters, is contained in Nowell's *Diseases of crop plants in the Lesser Antilles*, published in 1923, and the present volume serves to bring the knowledge of these diseases up to date. The six illustrations of the red ring disease are reproduced from Nowell's book. In all there are 37 plates, from excellent photographs, showing various aspects of the diseases. The diseases are discussed in ten chapters: I. The "bud rot" complex. II. Bronze leaf wilt. III. *Phytophthora* bud rot (*Phytophthora palmivora* Butler). IV. Tapering stem wilt or pencil point disease. V. Red ring disease (*Aphelenchus cocophilus* Cobb). VI. False wilt and lightning strike. VII. The stem-bleeding disease (*Ceratostomella paradoxa* (de Seynes) Dade). VIII. Root diseases (*Ganoderma lucidum* (Leysser) Karsten, *Fomes* sp. and *Fomes noxius* Corner). IX. Leaf diseases, including dieback and leaf blight diseases (*Diplodia* sp. and *Pestalotzia palmarum* Cooke), leaf stalk rot (*Phytophthora parasitica* Dastur), coconut thread blight (*Corticium penicillatum* Petch) and bacterial leaf blight. X. Gumming disease and dropping of nuts. The author maintains that many of these diseases are primarily due to unsuitable environmental conditions, and emphasizes the importance of sanitary measures. Thus in discussing the root diseases he writes (p. 142), "Measures should be adopted which will prevent the soil becoming too wet in the rainy seasons and deficient in soil moisture during the dry months. The two outstanding factors operative in this direction are effective draining of the

land and liming." Again (p. 159) he says, "The mechanism of growth and development in plant and animal life is most delicately balanced, and it infallibly responds to environmental factors in just the right measure and in a predetermined direction."

H.W.

324. BROWN, C. A. C. 631.588.1 : 633/635
A critical study of the application of electricity to agriculture and horticulture.
Tech. Rep. British Electrical and Allied Industries Res. Ass., Ref. W/T2, 1940,
 pp. 83, bibl. 236, 2s.

The uses to which electricity can be put in all kinds of agricultural and horticultural work are examined, the present position is discussed and certain prophecies are made. Among uses of particular interest to horticulturists the following are discussed:—for soil cultivation, irrigation, spraying, cool storing, heating awkward spots in glasshouses, hotbed heating, bench heating, as an aid to hydroponics, mushroom growing, sterilization of soil and of plants and bulbs, irradiation, dehydration of fruit, electro-culture, beehive heating, etc. The advantages and disadvantages are impartially discussed and the available information is clearly summarized.

325. AMANI. 632(072)
Annual report of the East African Agricultural Research Station for 1939, 1940, pp. 26. H.M. Stationery Office, London, 1s.

The outline of a general scheme drawn up in consultation with six Directors of Agriculture for the improvement of native crops in East Africa is set out, including the part that it is proposed should be played by Amani. The work which has chief place in the present research programme is the improvement of the two important native food crops, namely cassava and maize. The former in spite of its well-known dietetic deficiencies is still the most reliable and adaptable carbohydrate producer available to native agriculture. The present position in regard to research on virus diseases of cassava is described. Entomological work is confined to the investigation of the ecology of coffee plantations by means of detailed studies of particular insects of importance. In biochemistry work on the location, methods of formation and functions of the toxic substances of plants used to produce insecticides is in progress in order to obtain the fundamental knowledge necessary for an understanding of the toxic principles of these plants. In plant physiology a study of the transpiration of *Coffea arabica* has been completed. Shade, unless heavy enough to modify the saturation deficit of the air beneath it will not have much effect in reducing water-loss from coffee at any rate under clear skies. In fact water loss might be greater in a shaded than in an unshaded plantation. In dry conditions considerable internal control of water loss is exercised by the coffee-bush though whether at the expense of other constructive functions is not known. Reports are also given on soil science and plant genetics.

326. CAWTHRON. 634/635
Annual Report of the Cawthron Institute for 1939, 1940, Nelson, N.Z.,
 pp. 34.

Brief notes are given of research in different branches of agriculture. They include a number of items on fruit research. *Brown-spotting of apricots.* Borax sprays (0.10% strength) were successful in preventing it. *Internal cork of apples.* Effects of borax top dressing given at 50 lb. and 100 lb. per acre 4 years ago are still good. Excessive boron treatment inducing a boron content of more than 30 p.p.m. in the fruit is liable to increase internal breakdown. *Magnesium deficiency of apples.* In one case premature defoliation of apples was controlled by injecting magnesium sulphate into the branches. Various sources of magnesium are being tested. Results are being compared with leaf diagnosis. *Mottling of citrus leaves.* Mottling was associated with a low manganese and incidentally, in the bad cases, with a low magnesium content. *Apple manuring.* The importance of potassic manures has been shown. *Apple rootstocks.* Trials continue with Spy, Double Vigour and seedling stocks for Cox, Jonathan and Sturmer. *Orchard storage.* Trial is being made of the effect of picking dates, oil wraps and different types of case liner, and of orchard storing for 2 months before cool storing. *Woolly aphid.* Observations are being made on life history. In other fruit investigations reported there have been inconclusive results. Investigations on tomato concern tomato cloud, manuring,

canning and breeding. Those on tobacco include soil survey work, chemical criteria and quality, nicotine content, industrial recovery of nicotine, moisture uptake of tobacco, damping off, soil sterilization, seed germination, tobacco wilt.

327. SOUTH AFRICA, UNION OF. 634(058)
Annual Report of the Department of Agriculture and Forestry for year ended August 31st, 1940.
Fmg S. Afr., 1940, 15 : 443-544.

The report covers all the agricultural activities of the Department. In horticultural research, pp. 517-8, some definite conclusions are drawn from certain projects. *Citrus*. An interesting discovery is the higher total-soluble-solids content of a citrus variety when budded on sweet orange stock as compared with that of the same variety on rough lemon. The problem of low total soluble solids in some areas may thus be partially solved by budding on sweet orange. The physiological cause of "greening" of citrus in the eastern Transvaal is found to be soil deficiency in a number of essential plant ingredients such as zinc, magnesium, calcium, manganese, etc. In a long term manurial experiment at Nelspruit citrus plots under summer cover crop or clean cultivation are markedly superior to those under weeds, whether treatments with N, P and K are superimposed or not. The action of superphosphate sprays in reducing the acid content of Valencia orange reported on last year has carried over to this year without further treatment. It makes acid fruit available for packing at an earlier date and by its use the gap between the Washington Navel and Valencia crops can be filled. An out-of-season Valencia crop has a serious adverse effect on the size of the succeeding in-season crop. *Pineapple*. The two major manurial trials on old and new pineapple soils are showing signs that the differential treatments are producing significant differences. *Mango*. The modified Forkert patch bud method of budding produced a markedly higher take than shield budding. Budwood from which the leaves had been removed 14 days before cutting gave 25% higher take than budwood freshly cut in the ordinary way. When the tap root of the stocks was cut before budding the take was 20% more than on ordinary stocks in the nursery. Combination of these treatments resulted in 85% take with prepared budwood patch-budded on stocks whose tap roots had been cut and 44% with ordinary budwood T shield budded on untreated stock. *Deciduous fruits*. At the Vaal-Hartz Experiment Station nitrogen and phosphorus alone or in combination have had a marked beneficial effect on growth. *Viticulture*. Nitrogen and lime have been found important for maximum yields of sultana crops along the Orange river. Trellising the vines has increased the size of the crops and growers are being urged to make use of this method.

328. WÄDENSWIL (MEIER, K.). 634.1/8
 Bericht der Eidgenössischen Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil für die Jahre 1935/1937. (**Report of Wädenswil Horticultural Research Station for 1935/1937.**)
Landw. Jb. Schweiz, 1940, Heft 4, pp. 389-464.

In this report, which covers three working years, the sections which are of the greatest interest to the outsider are the research subsections dealing with fruitgrowing, fruit products, vine growing and vine products and market garden crops. Others deal with advisory work, the testing of plant protection devices and educational work. *Fruitgrowing*. Work has concerned the following:—clonal rootstocks for apples, apricots and nectarines; variety trials; cherry compatibility between varieties and cherry reaction to climatic conditions; pollination in apple and pear; manuring—pot and field experiments; diseases including apple scab and its control with a large number of materials, shot-hole disease in cherry, *Sclerotinia* disease of quince, *Macrophoma Malorum* disease of apple; pests including the cherry fruit fly and its hosts, and life history and control, the cherry fruit moth (? *Argyresthia* sp.), codlin moth and its control, the woolly aphid parasite *Aphelinus mali*, *Laspeyresia funebrana* and other pests. *Fruit products*. The effects of cold storing at 4° C., 2° and 0° C. on different varieties of apple; cool storage of cherries—the best conditions allowing for storage for 8-10 days were a temperature of 2° or 0° C. with 85-90% relative humidity; cool storage of cooking pears; waxing fruits to prevent shrivelling in store; the use of ultra-violet light to prevent decay in stored fruit; methods of making fruit wines; preparation of non-alcoholic fruit juices—considerable work on the different parts of the processing concerned; alcohol production; various dried fruit

products. *Vine growing.* Crosses of various table and wine varieties for improvement in quality; tests of ungrafted and grafted vines; effects of different rootstocks on yield; methods of vegetative propagation; pruning; frost covers; direct producers; diseases and pests of vines. *Vine products.* Improvements in fermentation process; effect of copper on yeast; obtaining grape wine yeast for use in fermenting grape, apple and other juices; the use of the electric katadyne method for determining the different sorts of tang left by the various processes involved in wine making; the removal of acidity in wine; wine diseases; various devices for controlling and preventing the presence of mould during the manufacture of grape juice. *Market garden crops.* *Primula malacoides* breeding; breeding new small fruits; breeding and selection of onions; selection of vegetable varieties; cultivation of blue hydrangeas; diseases and pests of flowers and vegetables.

References are made in the text to articles dealing fully with the work noted.

329. WEST AFRICAN AGRICULTURAL OFFICERS. 633/635(063)

Proceedings of the Third Conference of West African Agricultural Officers, Nigeria, 1938, Vol. 2 (received 1940), pp. 90.

The object of the Conference was to discuss broadly and informally a number of subjects connected with the problems of agriculture in West Africa. These discussions are recorded here, as also the resolutions passed by the Conference and the reports of committees. A large number of papers were presented. These have been published in a separate volume entitled "Papers. Third West African Agricultural Conference. Vol. I, 1938." Many of these papers have been extracted in the last and present issues of *Horticultural Abstracts*.

330. FEILDEN, G. ST. C. 635.65

Haricot beans.

Occ. Pap. Bur. Hort. Plant. Crops, East Malling, 6 (war), 1941, pp. 20, 1s.

This occasional paper has been compiled at the request of the Ministry of Agriculture to indicate the possibility of growing haricot beans as a wartime crop in the U.K. Notes on cultivation and varieties and experimental work in this country and North America are given.